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PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE 1, PHASE E,--ETC(U)
FEB 78 J A THOMPSON

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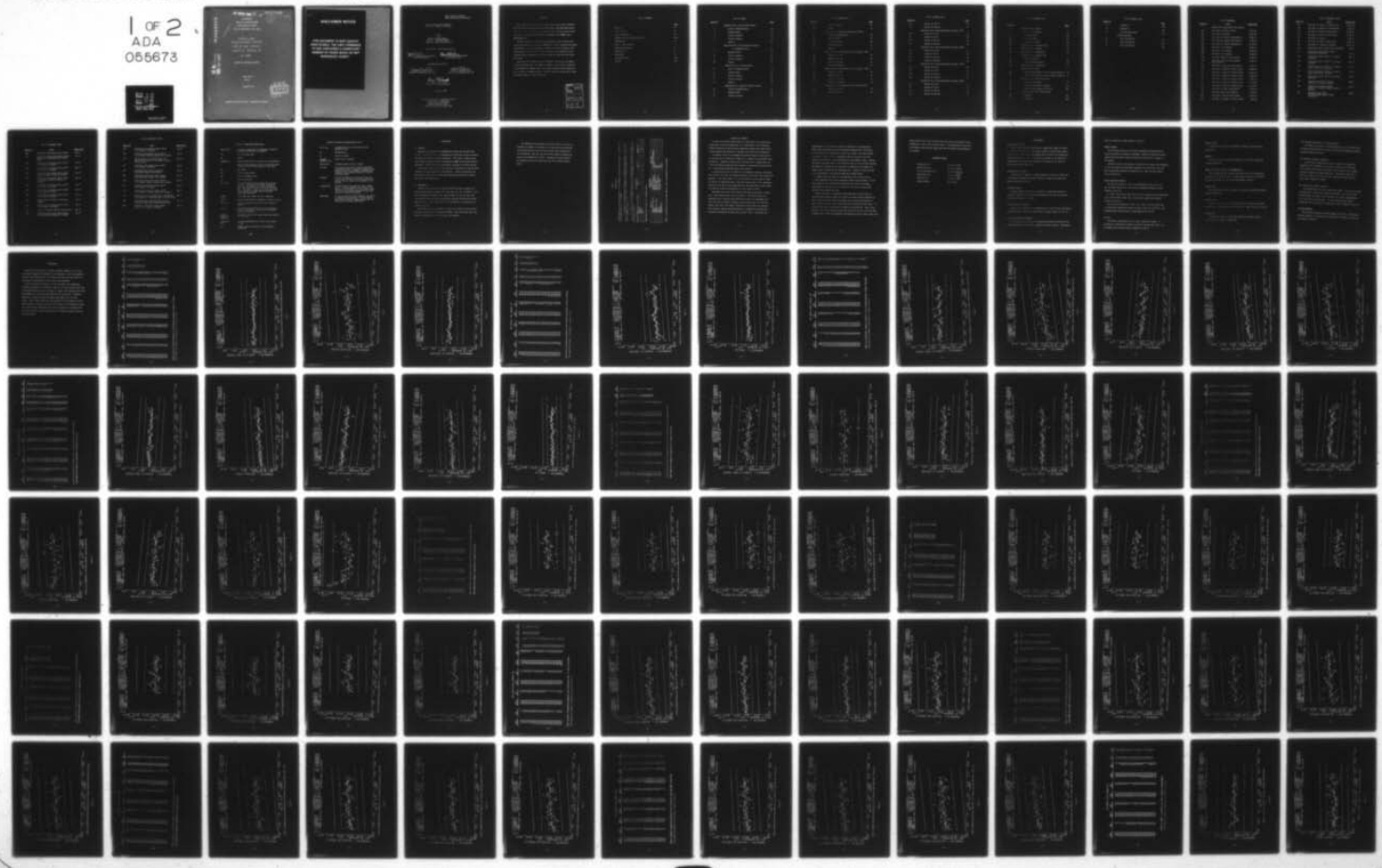

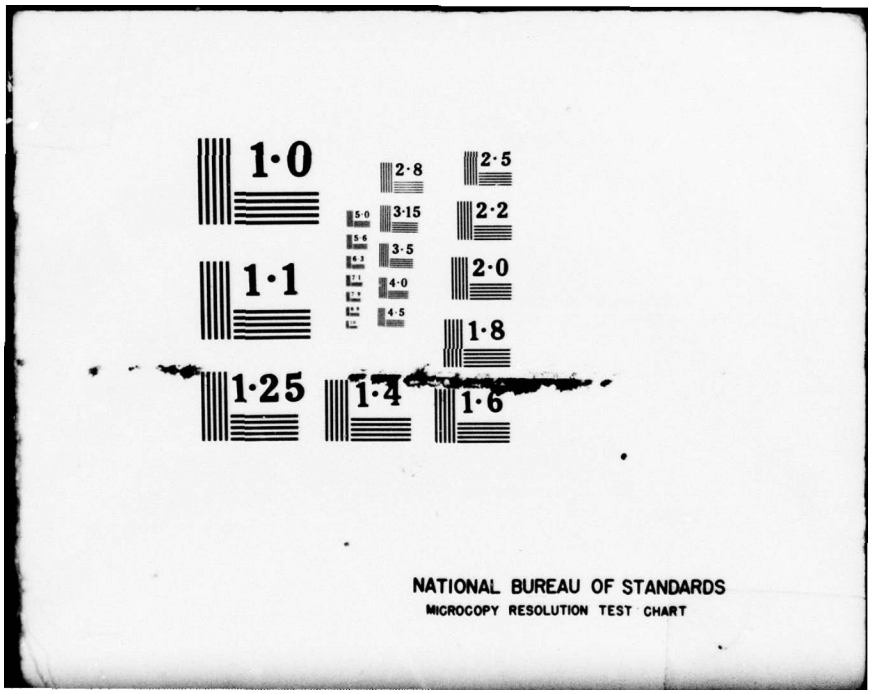
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NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

HEADQUARTERS

OGDEN AIR LOGISTICS CENTER

UNITED STATES AIR FORCE

HILL AIR FORCE BASE, UTAH 84406

PROPELLANT SURVEILLANCE REPORT LGM-30 F&G STAGE 1 PHASE E, SERIES IV

TP-H1011

PROPELLANT LABORATORY SECTION

MANCP REPORT

390(78)

FEBRUARY 1978

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MANCP REPORT NR 390(78)
MMWRM PROJECT M82934C-WNL17514

PROPELLANT SURVEILLANCE REPORT
LGM-30 F & G STAGE I (TP-H1011)

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February 1978

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ABSTRACT

This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMWRM Project M82934CWNL17514.

The data from this test period are combined with data from previous testing and entered into the G085 computer for storage, analysis and regression analysis. From the statistical analysis of all data tested to date (twelve and one half years for F and G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point.

Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the G085 system.

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LIST OF FIGURES (cont)

LIST OF FIGURES (cont)

LIST OF FIGURES (cont)

LIST OF REFERENCES

Report Nr	Title	Report Date
	LGM-30 First Stage, Wing I Test Reports	
29A	Test Report (Missile in silo)	13 Jan 64
29B	Zero Time Test Results	29 Jan 64
29C	Zero Time Test Results (Supplement 1)	30 Mar 64
29D	Zero Time Test Results (Aft Closure)	9 Jun 64
29E	Zero Time (Aft Closure Supplement 1)	24 Jun 64
29F	ATP Phase I Test Results	30 Mar 65
29G	ATP Phase I Test Results	19 Aug 65
29H	ATP Phase I Test Results	10 Sep 65
32A	Zero Time, Wings II-V Test Results	17 Mar 65
32B	Zero Time, Wings II-V Test Results (Aft Closure)	18 Mar 65
32C	ATP Phase I, Wings II-V Test Results	3 Nov 65
49	ATP Phase I, Wings II-V (First Group)	18 Mar 66
53	ATP Phase I, Wings II-V (Second Group)	22 Apr 66
55	ATP Phase I, Wings II-V (Third Group)	29 Apr 66
58	ATP Phase I, Wings II-V (Fourth Group)	6 May 66
61	ATP Phase I, Wings II-V (Fifth Group)	10 Jun 66
66	ATP Phase I, Wings II-V (Sixth Group)	22 Jul 66
76	ATP Phase II, Wing I Test Results	24 Jan 67
78	Zero Time, Wing VI Test Results	3 Feb 67
104	ATP Phase I, Wing VI (First Group)	12 Oct 67
118	ATP Phase II, Wings II-V (First Group)	5 Mar 68

LIST OF REFERENCES (CONT)

Report Nr	Title	Report Date
126	ATP Phase II, Wings II-V (Second Group	11 Apr 68
130	ATP Phase II, Wings II-V (Third Group)	3 May 68
162	ATP Phase I, Wing VI (Second Group)	30 Sep 69
176	ATP Phase II, Wing VI (First Group)	15 Apr 70
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185	ATP Phase I, Wing VI (Third Group)	22 Jun 70
195	ATP Phase III, Wings II-V (Retest)	29 Oct 70
223	Surveillance Report LGM-30 Stage I(TP-H1011)	Sep 71
239	Surveillance Report LGM-30 Stage I (TP-H1011 and TP-H1043)	Apr 72
258	Surveillance Report LGM-30 A & B Stage I (TP-H1011)	Nov 72
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271	Surveillance Report LGM-30 F & G Stage I Phase A Series II, (TP-H1011)	Jul 73
277	Surveillance Report LGM-30 F & G Stage I Phase A Series III, (TP-H1011)	Oct 73
280	Surveillance Report LGM-30 A & B Stage I (TP-H1011)	Nov 73
288	Propellant Surveillance Report LGM-30 A & B, Stage I, TP-H1043	Mar 74
290	Propellant Surveillance Report LGM-30 F & G, Stage I, Phase B, Series I TP-H1011	Mar 74
300	Minuteman Stage I Motor Reliability Improvement Program Surveillance	May 74

LIST OF REFERENCES (CONT)

Report Nr	Title	Report Date
302	Propellant Surveillance Report LGM-30	Nov 74
313	Stage 1 Propellant Surveillance Report, Propellant Containing Glacial Acrylic Acid	Oct 74
315	Propellant Surveillance Report LGM-30 F & G Stage 1, TP-H1011	Jan 75
316	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Feb 75
319	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VI, TP-H1011	Apr 75
321	Propellant Surveillance Report LGM-30 F & G Stage 1, Phase B, Series II, TP-H1011	Apr 75
325	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Jun 75
328	Propellant Surveillance Report LGM-30 A & B Stage 1, TP-H1011	Sep 75
330	Propellant Surveillance Report LGM-30 F & G Stage 1, TP-H1011	Oct 75
335	Stage 1 Motor Reliability Improvement Program	Dec 75
337	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1043	Feb 76
339	Stage 1, New MAPO & ERL-510 Qualification	Mar 76
341	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VII, TP-H1011	Mar 76

Report Nr	Title	Report Date
343	Propellant Sureveillance Report LGM-30 A & B, Stage 1, TP-H1011	Jun 76
345	Propellant Surveillance Report LGM-30 F & G, Stage 1 Phase B, Series III, TP-H1011	Jun 76
350	Qualification of a New MAPO Source and ERL-510 Curing Agent for Minuteman, Stage 1, UF-2121 Liner	Sep 76
351	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Sep 76
354	Minuteman Stage 1 Motor Reliability Improvement Program Surveillance	Sep 76
358	Propellant Surveillance Report LGM-30 Dissected Motors, Phase VIII, TP-H1011	Oct 76
360	Propellant Surveillance Report LGM-30 F & G, Stage 1 Phase E, Series III, TP-H1011	Nov 76
367	Propellant Surveillance Report LGM-30 A & B, Stage 1, TP-H1011	Apr 77
370	Propellant Surveillance Report LGM-30 F & G, Stage 1, Phase E, Series II, TP-H1011	Apr 77
377	Qualification of a New MAPO Source and ERL-510 Curing Agent for Minuteman Stage 1, UF-2121 Liner	Oct 77
379	Final RIP Report, Minuteman Stage 1 Motor Reliability Improvement Program Surveillance	Oct 77
385	Propellant Surveillance Report LGM-30 A, B, F, & G, Stage 1, TP-H1043	Dec 77

GLOSSARY OF TERMS AND ABBREVIATIONS

Aging Trend	A change in properties or performance resulting from aging of material or component
CSA	Cross Sectional Area
DB	Dogbone
Degradation	Gradual deterioration of properties or performance
E	Modulus (psi), defined as stress divided by strain along the initial linear portion of the curve.
EB	End Bonded
EGL	Effective Gage Length
em	Strain at maximum stress
er	Strain at rupture
"F" ratio	The ratio of the variance accounted for by the regression function to the random unexplained variance. The regression function having the most significant "F" ratio is used for plotting data. The ratio is also used in detecting significant changes in random variation between succeeding time points
JANNAF	Joint Army, Navy, NASA, Air Force Committee
MANCP	Propellant Lab Section at Ogden Air Logistics Center
Ogden ALC	Ogden Air Logistics Center, Air Force Logistics Command
r or R	The Correlation Coefficient is a measure of the degree of closeness of the linear relationship between two variables
Linear Regression Equation	The general form of the linear regression equation is $Y = a + bx$
Regression Line	Line representing mean test values with respect to time
S_b	Standard error of estimate of the regression coefficient

S_e or $S_{Y.X}$	Standard deviation of the data about the regression line
Sm	Maximum Stress
Sr	Stress at rupture
Standard Deviation (S_y)	Square root of variance
Strain Rate	Crosshead speed divided by the EGL
"t" test	A statistical test used to detect significant differences between a measured parameter and an expected value of the parameter (determines if regression slope differs from zero at the 95% confidence level)
Variance	The sum of squares of deviations of the test results from the mean of the series after division by one less than the total number of test results
3 Sigma Band	The area between the upper and lower 3 sigma limit. It can be expected that 99.73% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed.
90-90 Band	It can be stated with 90% confidence that 90% of the inventory represented by the test samples would fall within this range assuming that the population is normally distributed

INTRODUCTION

A. PURPOSE:

Laboratory testing has been performed for twelve and one half years on First Stage LGM-30 F and G Minuteman Motor propellant blocks to evaluate the effects of aging on TP-H1011 propellant. This report contains those tests conducted on propellant as instructed in MMEMP Test Directive GTD-1C, Amendment 2, LGM-30 First Stage Operational Propellant Laboratory Testing.

Statistical analysis of the data from tests performed will provide early warning if serious degradation trends develop. Annual evaluation of the propellant provides data for input into engineering reliability analysis for service life predictions.

B. BACKGROUND:

LGM-30 F and G testing was started in 1966 with phase testing at 24 month intervals (Report Numbers 78 - zero time; 104, 162, 185-Phase I; 176, 239, 257-Phase II; 271-Phase III). Report Number 257 was the first time that LGM-30 F and G data were statistically analyzed separately from LGM-30A and B data. The present report is a continuation of testing and statistical analysis.

Zero time testing for LGM-30A, B, F and G was started as soon as possible after receipt of the propellant by MANCP. Data from these tests were used to establish a base line for each test parameter.

The LGM-30F and G propellant test matrix (Table 1) is used to determine the number of specimens to be taken from each propellant loaf and the specific test or tests to which these specimens are to be subjected. Very low rate and low rate tensile specimens are taken on all LGM-30F and G blocks. Specimens for other physical and combustion tests are taken from every third (LGM-30F and G) block.

TABLE 1

SAMPLE PLAN

The Procedure for determining tests to be performed on propellant batch samples of IGM-30 F & G First Stage Motors are as follows:

1. Divide the USAF motor serial numbers into three groups by dividing the last three digits of each serial number by three to determine the remainder integer, e.g., 154 ÷ 3 = 51 with a remainder integer of 1.

2. Use the remainder integer to enter the following matrix to determine the group of tests to be performed on the forward, middle, and aft batch samples associated with a particular motor serial number.

GROUP MATRIX

TP-H1011 PROPELLANT BATCH SAMPLE	GROUP I	GROUP II	GROUP III
Forward	1	2	0
Middle	0	1	2
Aft	2	0	1

Each group will receive the following tests:

TEST MATRIX

GROUP I	GROUP II	GROUP III
High Rate Triaxial	Dynamic Response	High Rate Hydrostatic
Creep	Stress Relaxation	Sol Gel
Biaxial Low Rate	Burning Rate	DSC
TCLE	Heat of Explosion	TGA
Hardness	Pressure Time	DTA
Ignitability		Impact

NOTE: Low Rate and Very Low Rate Tensile tests are performed on all blocks.

STATISTICAL APPROACH

In order to determine aging trends for shelf/service life predictions, as directed by Service Engineering, First Stage LGM-30 F and G Minuteman TP-H1011 propellant blocks have been undergoing testing since 1966, statistically analyzed and reported on a regular test cycle by this laboratory.

The primary reason for performing statistical analysis on test data is for the detection of propellant changes due to aging that would affect motor reliability. Regression analysis was the method used to examine data and to aid in drawing conclusions about dependency relationships that may exist i.e., relationship between age versus test results.

In selecting the best fit model for the regression equation, six models were fitted to the data (see regression models at the end of this statistical approach). The linear model $Y = a + bX$ was found to be the best fit model for 96% of the regression plots. The model used is shown in the regression equation at the top of every regression plot and those which are not linear will also be listed and discussed in the test results section.

Individual data points from different time periods were used to establish a least squares trend line for the data. The variance about the regression line, obtained using individual values of the dependent variable, was used to compute a tolerance interval such that at the 90% confidence level 90% of the sample distribution falls within this interval. This tolerance interval was extrapolated to a maximum of 24 months into the future from age of the odest motor tested. The 't' values and the

significance of this statistic, which are reported for each regression model, give an indication of the "statistical significance" of the slope of the trend line as compared to a line of zero slope. Data were plotted by computer. The 'y' axis is computed so that the values at one inch intervals are peculiar to the data spread of the parameter tested. Plotted data points represent means at the particular ages at which testing occurred. The number of specimens at each age point is indicated on the sample size summary sheet accompanying the regression plot. Variance at each test age can be determined by consulting the G085 data storage system.

A comparison of the slopes of the regression trend lines and their Y - axis intercepts found in the regression equation was performed. Of the tests common to this test period and the last test, more of the aging trend lines have become flatter or closer to a line of zero slope which indicates less change due to age.

A post cure effect (propellant stabilizing after the first year or two) has been observed on some of the early test data (stress relaxation at -65°F, -40°F, and 20°F; TGA percent weight loss at 250°C; DTA exotherm 1, and exotherm 2); which tended to bias and skew the projected trend lines. To overcome this factor, two methods of analysis were performed: First, where possible, non-linear models were used that would best fit the total data (TGA % weight loss at 250°C, DTA exotherm 1 and exotherm 2 data); second, where non-

linear models did not fit the data, this early data was eliminated (Stress Relaxation at -60°F, -40°F, and 20°F data). By compensating for this post cure biasing a more accurate aging trend line for service life prediction is provided.

REGRESSION MODELS

Reciprocal of X	$Y = a + b\ (1/X)$
Natural log of X	$Y = a + b\ (LN\ X)$
LOG to the base 10 of X	$Y = a + b\ (LOG\ X)$
Square Root of X	$Y = a + b\ \sqrt[2]{X}$
Cube Root of X	$Y = a + b\ \sqrt[3]{X}$
Linear equation	$Y = a + bX$

TEST RESULTS

VERY LOW RATE TENSILE:

Very low rate data regressions show no significant change for strain at maximum stress with strain at rupture showing a statistically significant decrease. The stresses and modulus show a statistically significant increase (Figures 1 thru 5). The trends are gradual for the respective regressions and no operational problems are expected for at least two years after the last test date.

LOW RATE BIAXIAL TENSILE:

A statistically significant gradual decrease is shown for strains and a statistically significant gradual increase is shown for stresses and modulus (Figures 6 thru 10).

LOW RATE TENSILE:

Low rate tensile data shows a statistically significant gradual decrease for strains and a statistically significant increase for stresses and modulus (Figures 11 thru 15).

HIGH RATE TRIAXIAL TENSILE:

The strains, maximum stress and modulus show a statistically significant gradual decrease. Stress at rupture shows no change (Figures 16 thru 20).

HIGH RATE HYDROSTATIC TENSILE:

The strains show a statistically significant gradual decrease with the stresses showing a statistically significant gradual increase. The modulus

shows no significant change (Figures 21 thru 25).

TENSILE SUMMARY:

The test data shows that the strain is gradually decreasing and the stress and modulus is gradually increasing, except for high rate triaxial regressions which shows a gradual decrease for stress and no change in the modulus.

Therefore, based on the analysis of data from the tensile test parameters, it does not appear that meaningful degradation is occurring at this time and no operational problems are expected for at least two years beyond the last data point.

STRESS RELAXATION MODULUS:

For the 0.5% strains at -65°F, the regressions for data at 10, 50, 100, and 1000 seconds show a statistically significant gradual increase (Figures 26 thru 29).

At -40°F, the 10 second data does not show a change while the regressions at 50, 100 and 1000 seconds show a statistically significant decrease (Figures 30 thru 33).

The 3% strain regressions at 20°F, 77°F, 100°F, 140°F and 180°F show a statistically significant gradual increase; except for the 20°F 10 sec regression which does not show a change (Figures 34 thru 53).

SOL GEL:

The percent extractables does not show a significant change. A statistically significant increase is shown for the gel swell ratio, sol gel density and crosslink density (Figures 54 thru 57).

CONSTANT STRAIN:

A statistically significant decrease is shown for constant strain (Figure 58).

HARDNESS:

Shore A ten second hardness data shows a statistically significant increase (Figure 59).

SUMMARY OF SOL GEL, TENSILE AND HARDNESS DATA:

The crosslink density, constant strain and sol gel data regressions correlate with the tensile data. As the polymer continues to crosslink, the strain decreases and the stress and hardness increases.

BURNING RATE:

The burning rate regression shows a statistically significant gradual decrease (Figure 60).

PRESSURE TIME:

Maximum pressure shows a statistically significant gradual decrease and the time to maximum pressure does not show a change (Figures 61 and 62).

IGNITABILITY:

Ignitability shows a statistically significant gradual increase in time required for ignition (Figure 63).

TCLE (Thermal Coefficient of Linear Expansion):

The thermal coefficient of linear expansion for both below and above the glass transition point (Tg) shows a statistically significant gradual increase (Figures 64 and 65).

TGA (Thermal Gravimetric Analysis):

A statistically significant increase is shown for the ignition temperature (9°C rise/min) and the percent weight loss at 250°C hold (12°C rise/min to hold) with the weight loss at ignition (9°C rise/min) showing no significant change (Figure 66). The percent weight loss at 250°C hold, model $\frac{1}{X}$ was found to better represent the data than the linear model (Figures 67 and 68).

DTA (Differential Thermal Analysis):

The endotherm does not show a significant change. The first and second exotherms show a statistically significant decrease. For the first and second exotherm, the model log X was found to be a better representative of the data than the linear model. The third exotherm and ignition temperature show a statistically significant increase (Figures 69 thru 73).

FAILURE ENVELOPES:

Three failure envelopes are shown (Figures 74 thru 76). Each failure envelope represents a raw material lot and these lot numbers are listed on the respective figures.

CONCLUSIONS

Twelve and one half years of aging at ambient temperature (77°F) has not greatly changed the properties of the propellant. Some test parameters indicate slight aging trends, but nothing that would adversely affect the operational characteristics of the rocket motor propellant.

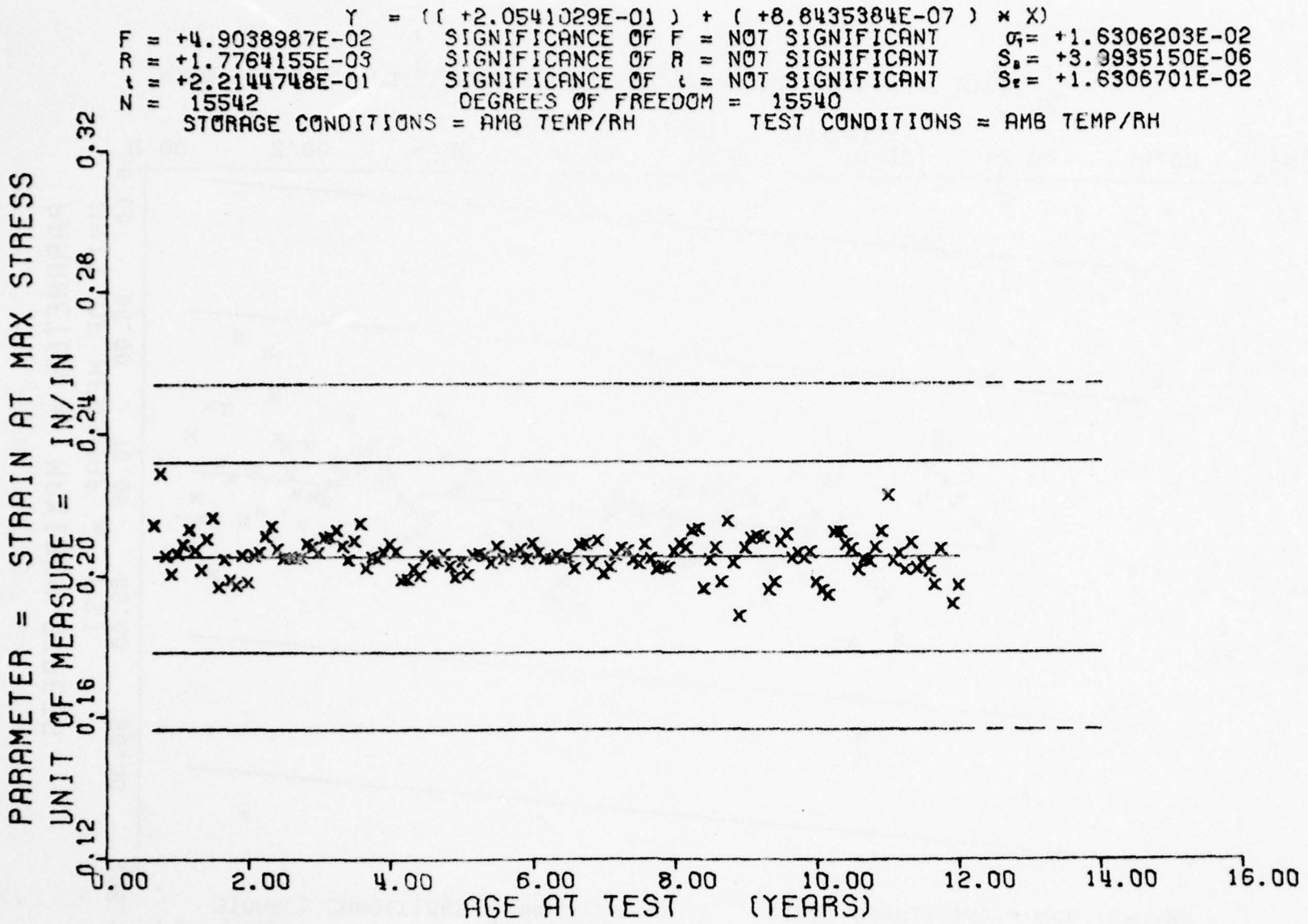
From the statistical analysis, it does not appear that significant propellant degradation is occurring. Based on the twelve and one half years of accumulated data, there is no reason to suspect that properties will show much change for at least two years past the last data point. Therefore, propellant reliability should not change appreciably over that time period. Since failure limits are not available for the parameters tested, this statement is based on the fact that the slope of the regression curves where statistically significant are, with few exceptions, relatively flat or close to a line of zero slope and have not changed appreciably from the last test period.

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES	AGE MONTHS	NR SAMPLES
8.0	3	33.0	140	58.0	249	83.0	69	108	72	133	50
9.0	10	34.0	139	59.0	220	84.0	26	109	96	134	72
10.0	8	35.0	107	60.0	294	85.0	36	110	48	135	33
11.0	15	36.0	212	61.0	198	86.0	64	111	21	136	24
12.0	21	37.0	132	62.0	265	87.0	104	112	115	137	84
13.0	42	38.0	108	63.0	196	88.0	121	113	271	138	234
14.0	28	39.0	96	64.0	126	89.0	130	114	142	139	139
15.0	38	40.0	113	65.0	90	90.0	114	115	118	140	36
16.0	43	41.0	146	66.0	61	91.0	71	116	288	141	9
17.0	55	42.0	112	67.0	24	92.0	55	117	238	143	6
18.0	28	43.0	120	68.0	116	93.0	90	118	125	144	6
19.0	49	44.0	97	69.0	174	94.0	84	119	126		
20.0	24	45.0	135	70.0	207	95.0	122	120	189		
21.0	56	46.0	116	71.0	117	96.0	155	121	102		
22.0	27	47.0	148	72.0	107	97.0	111	122	9		
23.0	67	48.0	138	73.0	80	98.0	135	123	39		
24.0	55	49.0	151	74.0	125	99.0	162	124	36		
25.0	63	50.0	176	75.0	147	100.0	139	125	69		
26.0	47	51.0	329	76.0	108	101.0	121	126	44		
27.0	50	52.0	296	77.0	136	102.0	51	127	95		
28.0	56	53.0	256	78.0	85	103.0	55	128	51		
29.0	40	54.0	226	79.0	108	104.0	45	129	48		
30.0	73	55.0	468	80.0	101	105.0	9	130	160		
31.0	82	56.0	437	81.0	128	106.0	11	131	176		
32.0	148	57.0	367	82.0	117	107.0	10	132	138		

WING 6,V.L.R.TENSILE,STRESS AT RUPTURE,CHS=0.002 IN/MIN TP-H1011

This sample size summary is applicable to figures 1 thru 3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8.00
10.00
12.00
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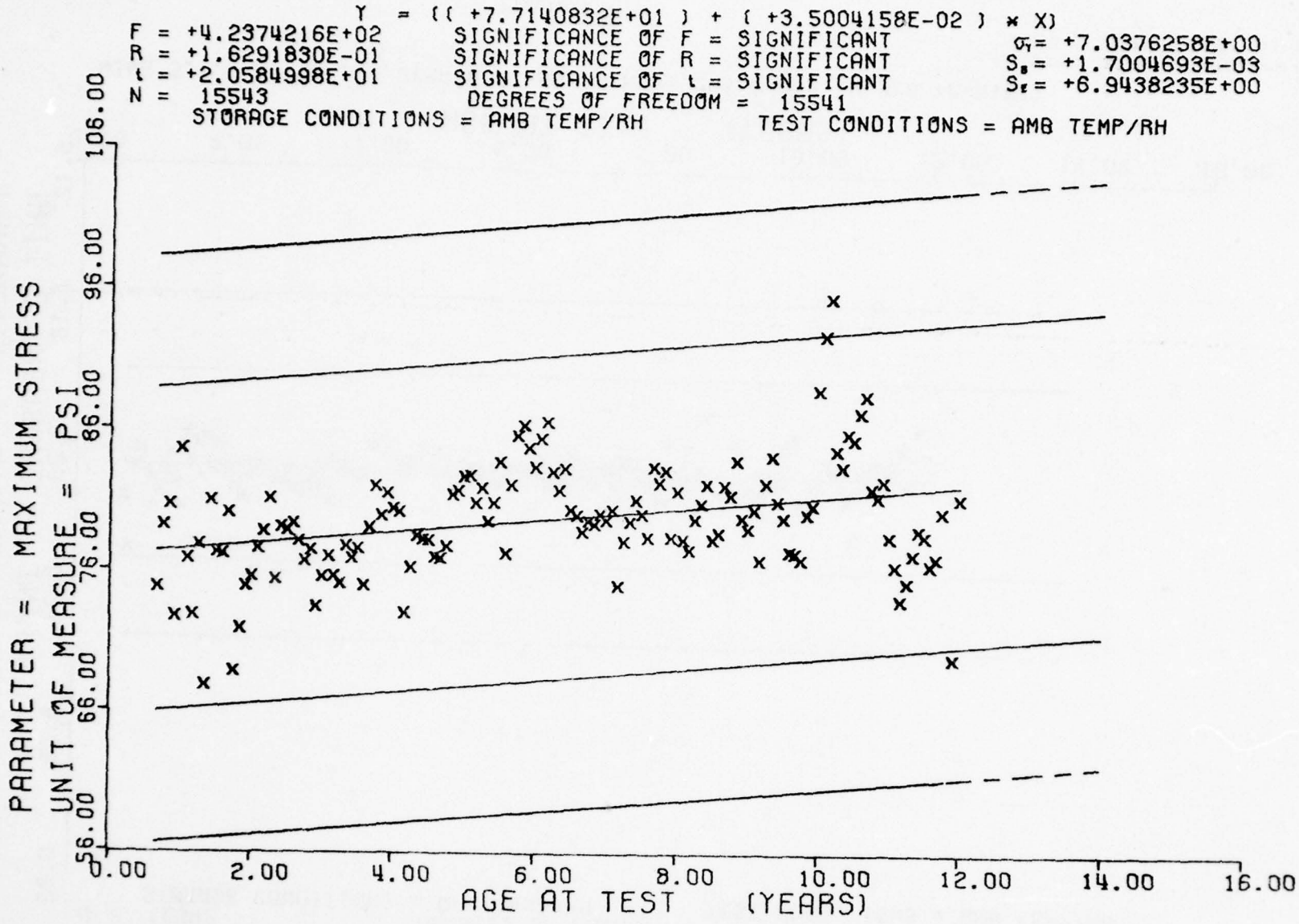
AGE AT TEST (YEARS)
WING 6,V.L.R.TENSILE,STRAIN AT MAX STRESS,CHS=0.002 IN/MIN TP-H1011

Figure 1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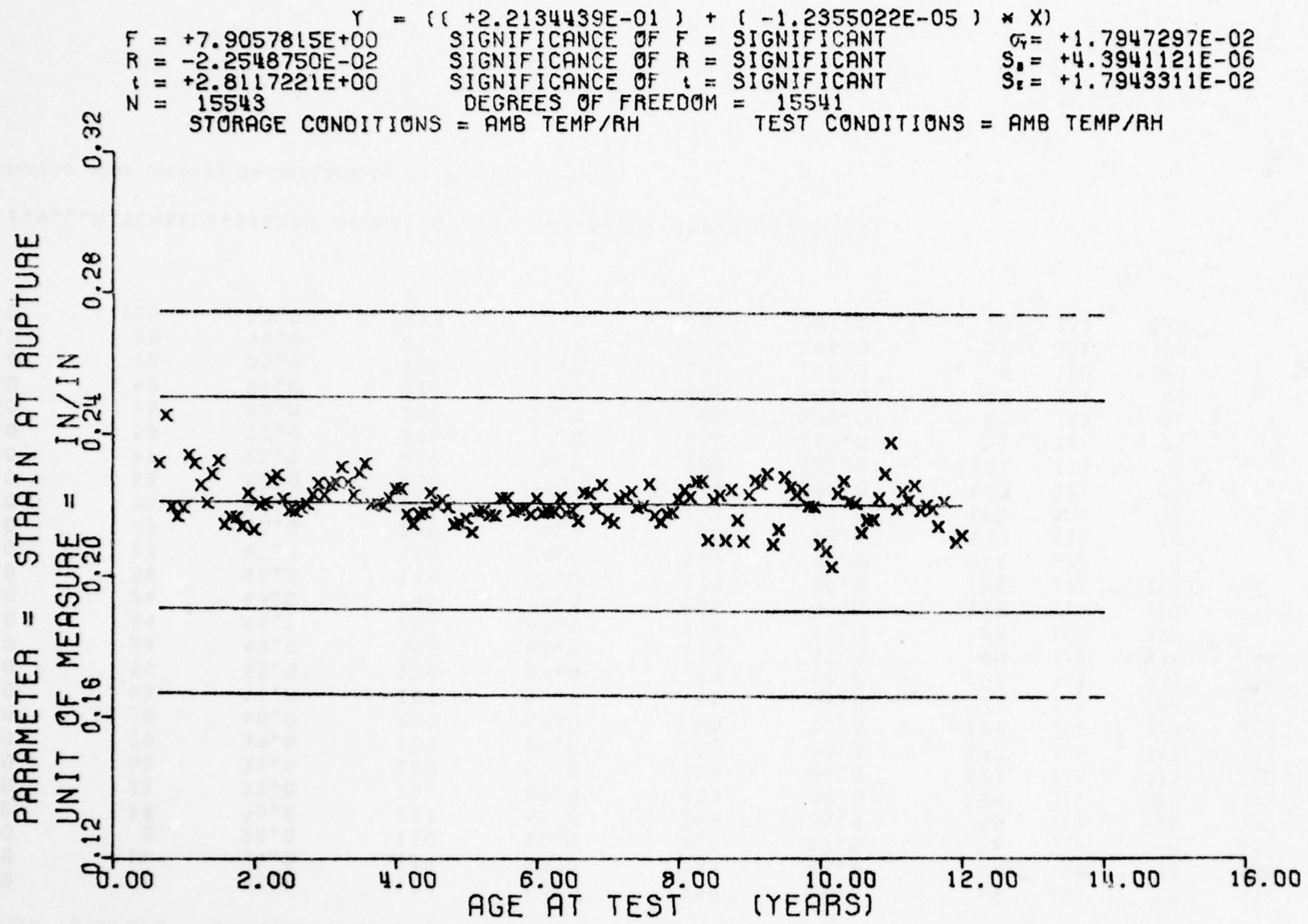
AGE AT TEST (YEARS)
WING 6,V.L.R.TENSILE,MAXIMUM STRESS,CHS=0.002 IN/MIN TP-H1011

Figure 2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16.00
AGE AT TEST (YEARS)
WING 6,V.L.R.TENSILE,STRAIN AT RUPTURE,CHS=0.002 IN/MIN TP-H1011

Figure 3

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES	AGE MONTHS	NR SAMPLES
8.0	3	33.0	152	58.0	325	83.0	69	108	72	133	50
9.0	10	34.0	154	59.0	287	84.0	26	109	96	134	72
10.0	8	35.0	110	60.0	382	85.0	36	110	48	135	33
11.0	15	36.0	222	61.0	242	86.0	65	111	21	136	24
12.0	21	37.0	141	62.0	295	87.0	104	112	115	137	84
13.0	42	38.0	123	63.0	219	88.0	121	113	271	138	234
14.0	28	39.0	105	64.0	130	89.0	130	114	141	139	139
15.0	38	40.0	119	65.0	90	90.0	114	115	118	140	36
16.0	43	41.0	153	66.0	61	91.0	71	116	288	141	9
17.0	55	42.0	120	67.0	24	92.0	55	117	238	143	6
18.0	28	43.0	142	68.0	116	93.0	90	118	125	144	6
19.0	49	44.0	100	69.0	174	94.0	84	119	126		
20.0	24	45.0	135	70.0	206	95.0	122	120	189		
21.0	56	46.0	116	71.0	117	96.0	155	121	102		
22.0	27	47.0	148	72.0	107	97.0	111	122	9		
23.0	67	48.0	138	73.0	80	98.0	135	123	39		
24.0	55	49.0	151	74.0	125	99.0	162	124	36		
25.0	63	50.0	176	75.0	147	100.0	139	125	69		
26.0	47	51.0	329	76.0	108	101.0	121	126	44		
27.0	50	52.0	296	77.0	136	102.0	51	127	95		
28.0	56	53.0	256	78.0	85	103.0	55	128	51		
29.0	40	54.0	226	79.0	108	104.0	45	129	48		
30.0	73	55.0	468	80.0	101	105.0	9	130	160		
31.0	88	56.0	437	81.0	128	106.0	11	131	176		
32.0	153	57.0	377	82.0	117	107.0	10	132	138		

WING 6,V.L.R.TENSILE,STRAIN AT MAX STRESS,CHS=0.002 IN/MIN TP-H1011

This sample size summary is applicable to Figures 4 and 5

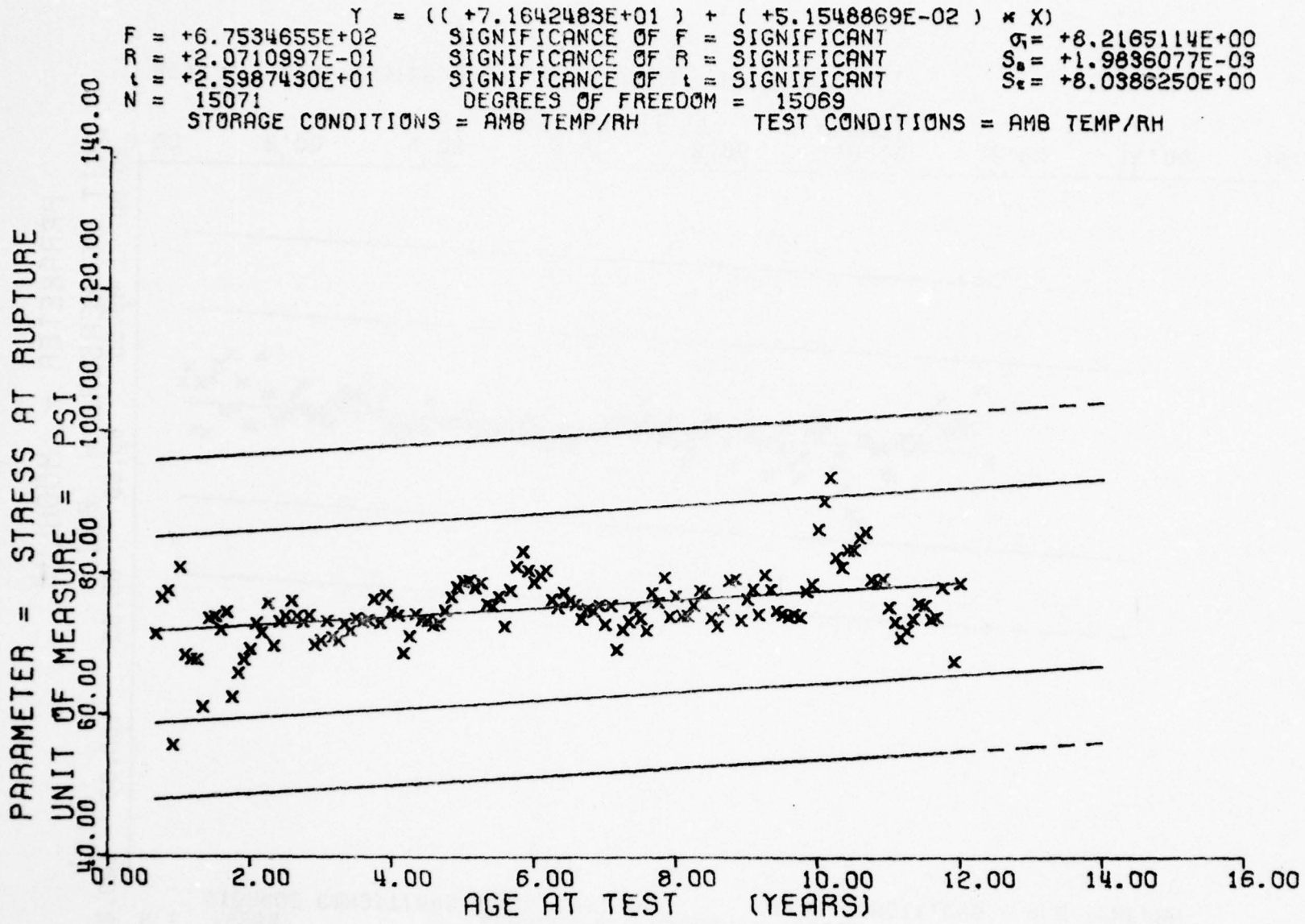

Y = ((+7.1642483E+01) + (+5.1548869E-02) * X)
F = +6.7534655E+02 SIGNIFICANCE OF F = SIGNIFICANT σ = +8.2165114E+00
R = +2.0710997E-01 SIGNIFICANCE OF R = SIGNIFICANT Sa = +1.9836077E-03
t = +2.5987430E+01 SIGNIFICANCE OF t = SIGNIFICANT Se = +8.0386250E+00
N = 15071 DEGREES OF FREEDOM = 15069
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRESS AT RUPTURE
UNIT OF MEASURE = PSI
140.00
120.00
100.00
80.00
60.00
40.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,V.L.R.TENSILE,STRESS AT RUPTURE,CHS=0.002 IN/MIN TP-H1011

Figure 4

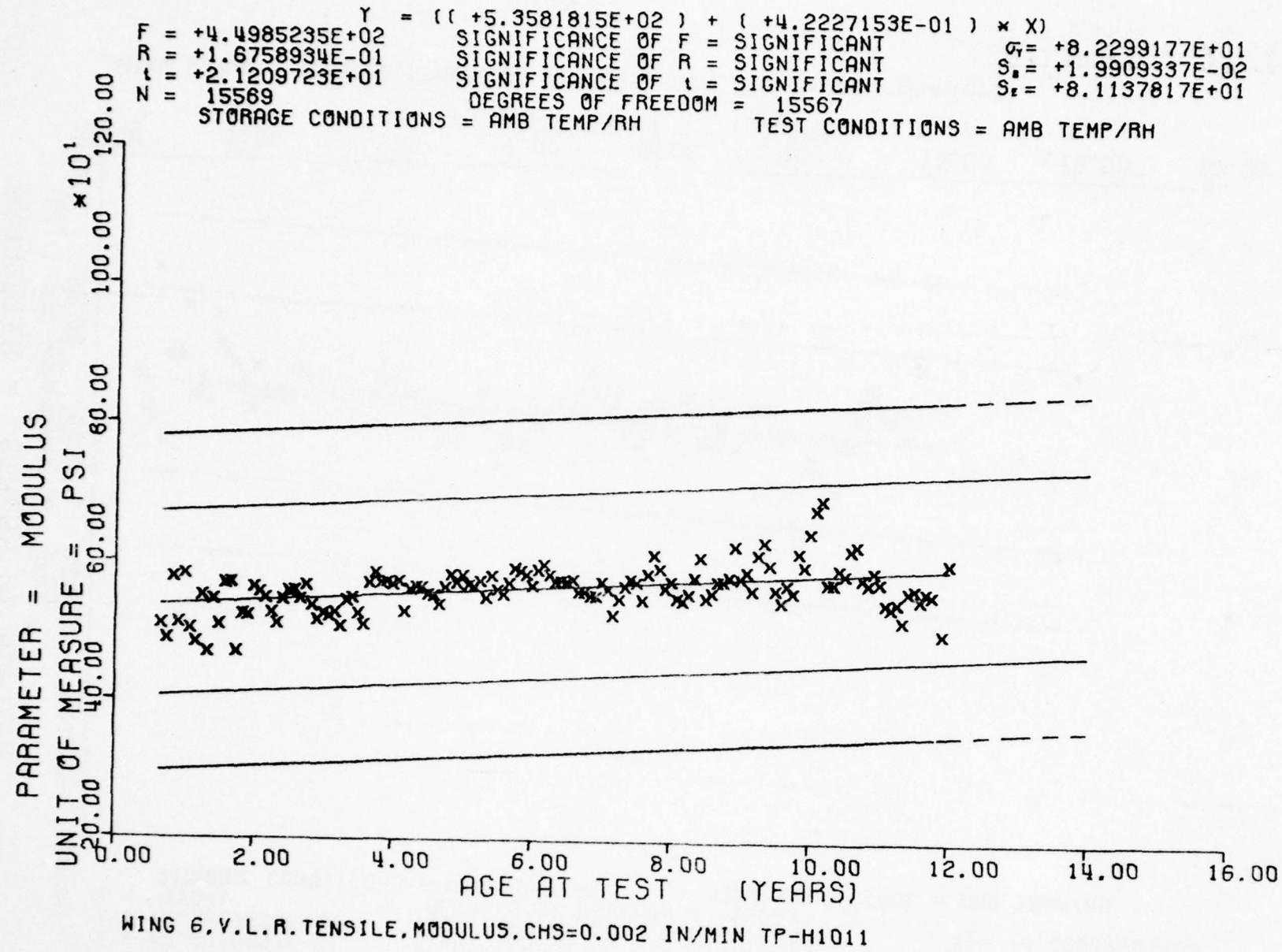

Y = ((+5.3581815E+02) + (+4.2227153E-01) * X)
F = +4.4985235E+02
SIGNIFICANCE OF F = SIGNIFICANT
σT = +8.2299177E+01
R = +1.6758934E-01
SIGNIFICANCE OF R = SIGNIFICANT
Sa = +1.9909337E-02
t = +2.1209723E+01
SIGNIFICANCE OF t = SIGNIFICANT
Se = +8.1137817E+01
N = 15569
DEGREES OF FREEDOM = 15567
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MODULUS
UNIT OF MEASURE = PSI
*10¹
120.00
100.00
80.00
60.00
40.00
20.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,V.L.R.TENSILE,MODULUS,CHS=0.002 IN/MIN TP-H1011

Figure 5

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
1.0	1	33.0	22	58.0	26	83.0	14	109	20
8.0	2	34.0	26	59.0	12	84.0	2	110	23
9.0	4	35.0	24	60.0	18	85.0	2	111	8
11.0	2	36.0	28	61.0	8	86.0	1	112	8
12.0	12	37.0	12	62.0	28	87.0	4	113	13
13.0	20	38.0	10	63.0	28	88.0	2	114	12
14.0	4	39.0	14	64.0	20	89.0	2	115	12
15.0	16	40.0	14	65.0	6	90.0	6	116	48
16.0	12	41.0	12	66.0	7	91.0	2	117	64
17.0	14	42.0	6	67.0	6	92.0	8	118	26
18.0	16	43.0	2	68.0	4	93.0	10	119	32
19.0	14	44.0	2	69.0	4	94.0	20	120	40
20.0	16	45.0	4	70.0	8	95.0	22	121	30
21.0	12	46.0	6	71.0	4	96.0	22	122	4
22.0	10	47.0	2	72.0	8	97.0	33	125	4
23.0	13	48.0	4	73.0	16	98.0	45	127	10
24.0	16	49.0	4	74.0	16	99.0	38	128	1
25.0	25	50.0	6	75.0	25	100.0	16	129	6
26.0	22	51.0	28	76.0	10	101.0	8	130	18
27.0	24	52.0	31	77.0	17	102.0	8	131	74
28.0	28	53.0	24	78.0	20	103.0	2	132	16
29.0	23	54.0	12	79.0	18	104.0	4	133	4
30.0	26	55.0	28	80.0	15	105.0	2	134	17
31.0	26	56.0	22	81.0	20	106.0	6	135	8
32.0	42	57.0	30	82.0	18	108.0	6	136	2
								137	14
								138	56
								139	30
								141	2
								144	3

WING 6,L.R.BIAXIAL TENSILE,STRAIN AT MAX STRESS,CHS=0.2 IN/MIN TPH-1011

This sample size summary is applicable to Figures 6 thru 10.

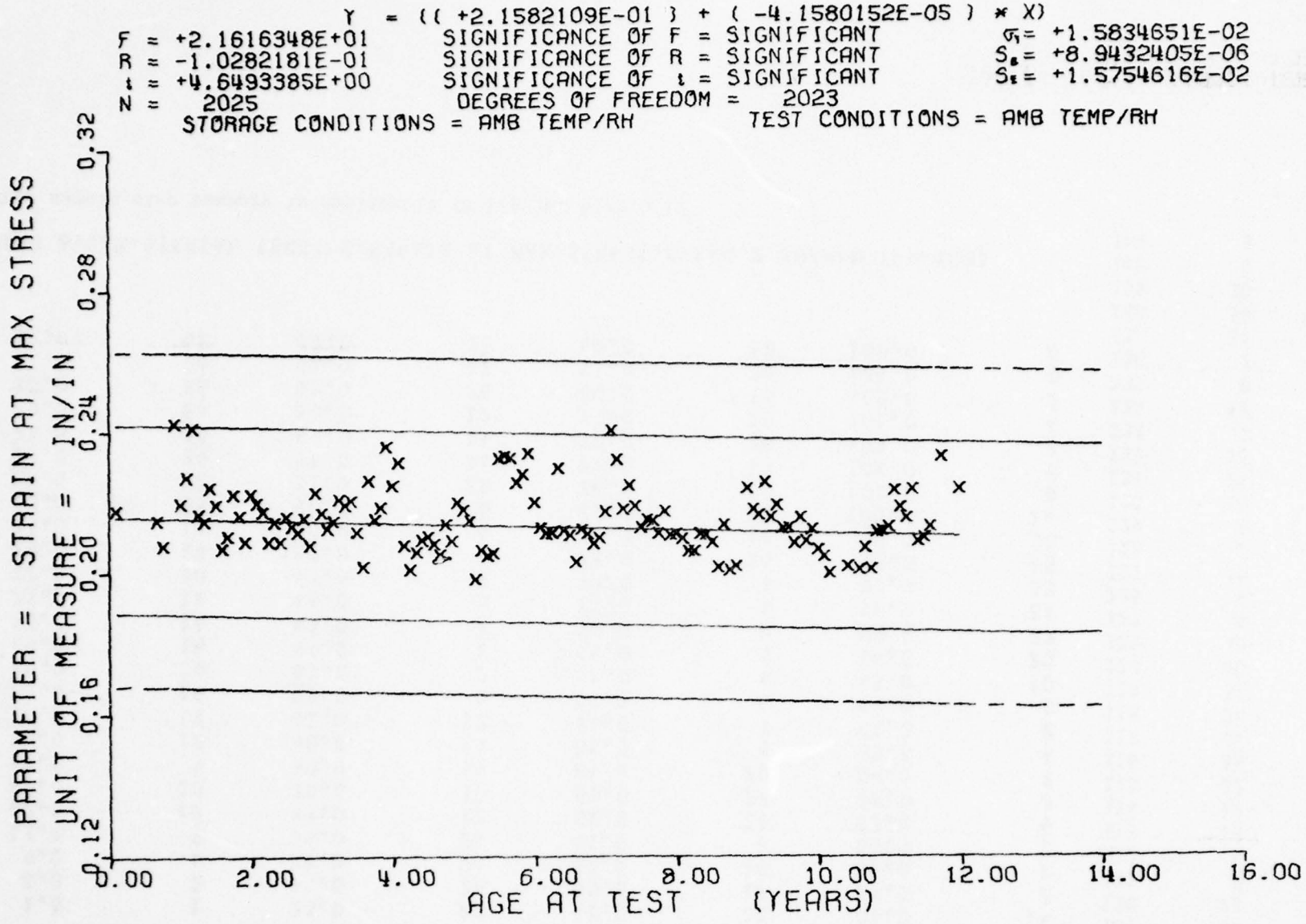

Y = ((+2.1582109E-01) + (-4.1580152E-05) * X)
F = +2.1616348E+01 SIGNIFICANCE OF F = SIGNIFICANT
R = -1.0282181E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +4.6493385E+00 SIGNIFICANCE OF t = SIGNIFICANT
N = 2025 DEGREES OF FREEDOM = 2023
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT MAX STRESS
UNIT OF MEASURE = IN/IN
0.12
0.16
0.20
0.24
0.28
0.32
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.BIAXIAL TENSILE,STRAIN AT MAX STRESS,CHS=0.2 IN/MIN TPH-1011

Figure 6

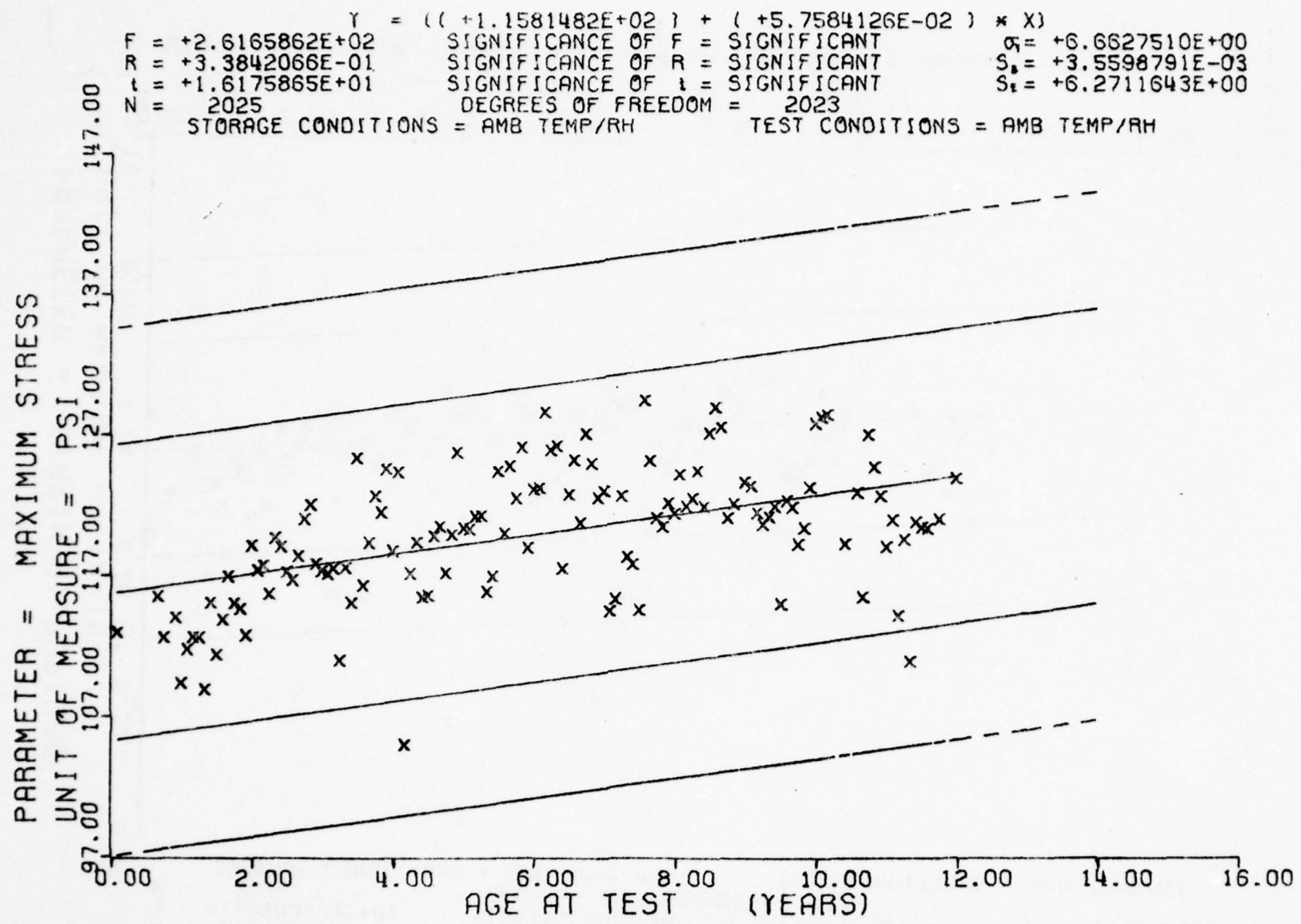

Y = ((+1.1581482E+02) + (+5.7584126E-02) * X)
F = +2.6165862E+02 SIGNIFICANCE OF F = SIGNIFICANT σ = +6.6627510E+00
R = +3.3842066E-01 SIGNIFICANCE OF R = SIGNIFICANT S_b = +3.5598791E-03
t = +1.6175865E+01 SIGNIFICANCE OF t = SIGNIFICANT S_t = +6.2711643E+00
N = 2025 DEGREES OF FREEDOM = 2023
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MAXIMUM STRESS
UNIT OF MEASURE = PSI
97.00
107.00
117.00
127.00
137.00
147.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.BIAXIAL TENSILE,MAXIMUM STRESS,CHS=0.2 IN/MIN TPH-1011

Figure 7

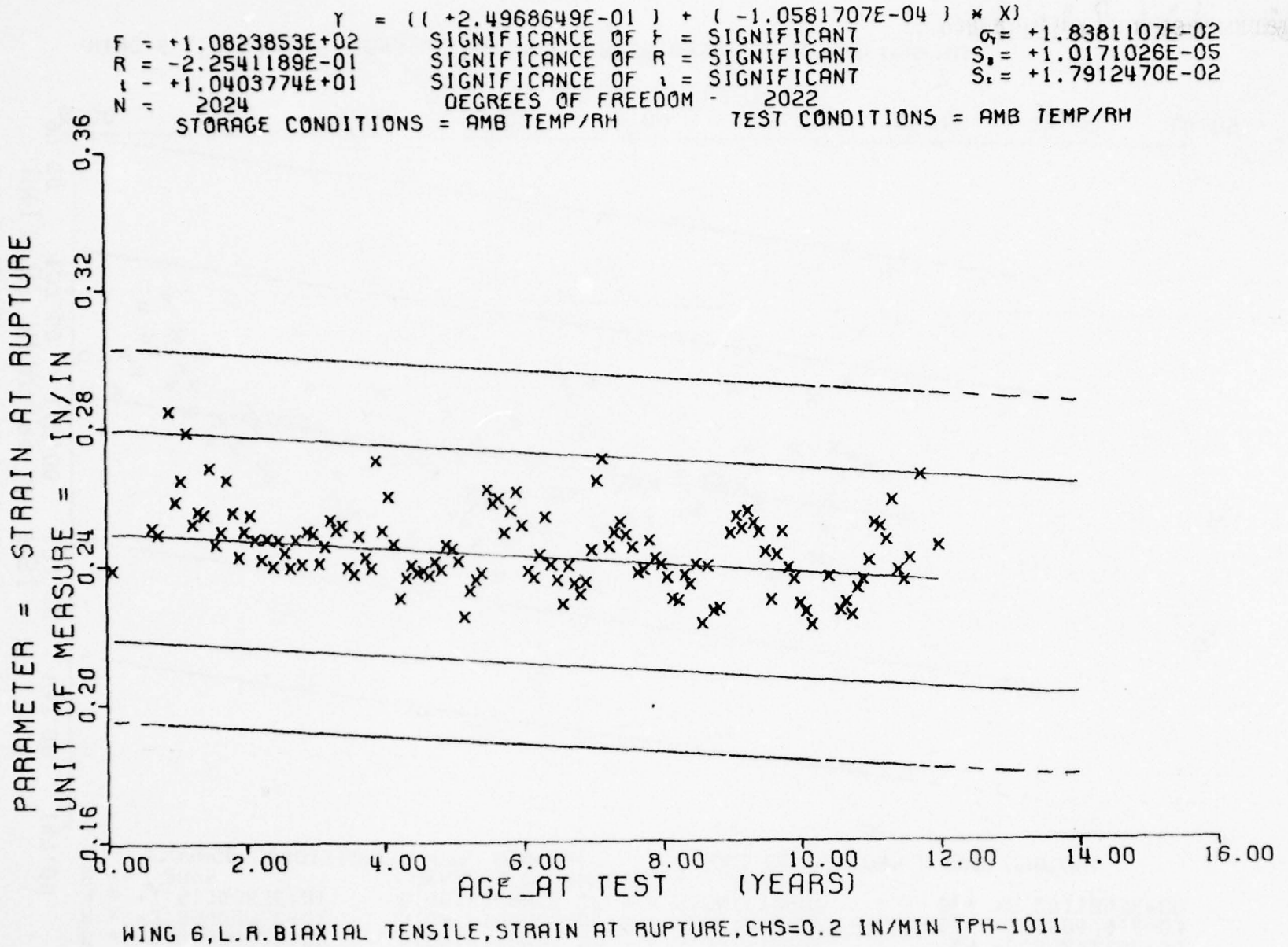

Y = ((+2.4968649E-01) + (-1.0581707E-04) * X)
F = +1.0823853E+02 SIGNIFICANCE OF F = SIGNIFICANT σ = +1.8381107E-02
R = -2.2541189E-01 SIGNIFICANCE OF R = SIGNIFICANT S0 = +1.0171026E-05
t = +1.0403774E+01 SIGNIFICANCE OF t = SIGNIFICANT St = +1.7912470E-02
N = 2024 DEGREES OF FREEDOM = 2022
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT RUPTURE
UNIT OF MEASURE = IN/IN
0.36
0.32
0.28
0.24
0.20
0.16
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.BIAXIAL TENSILE,STRAIN AT RUPTURE,CHS=0.2 IN/MIN TPH-1011

Figure 8

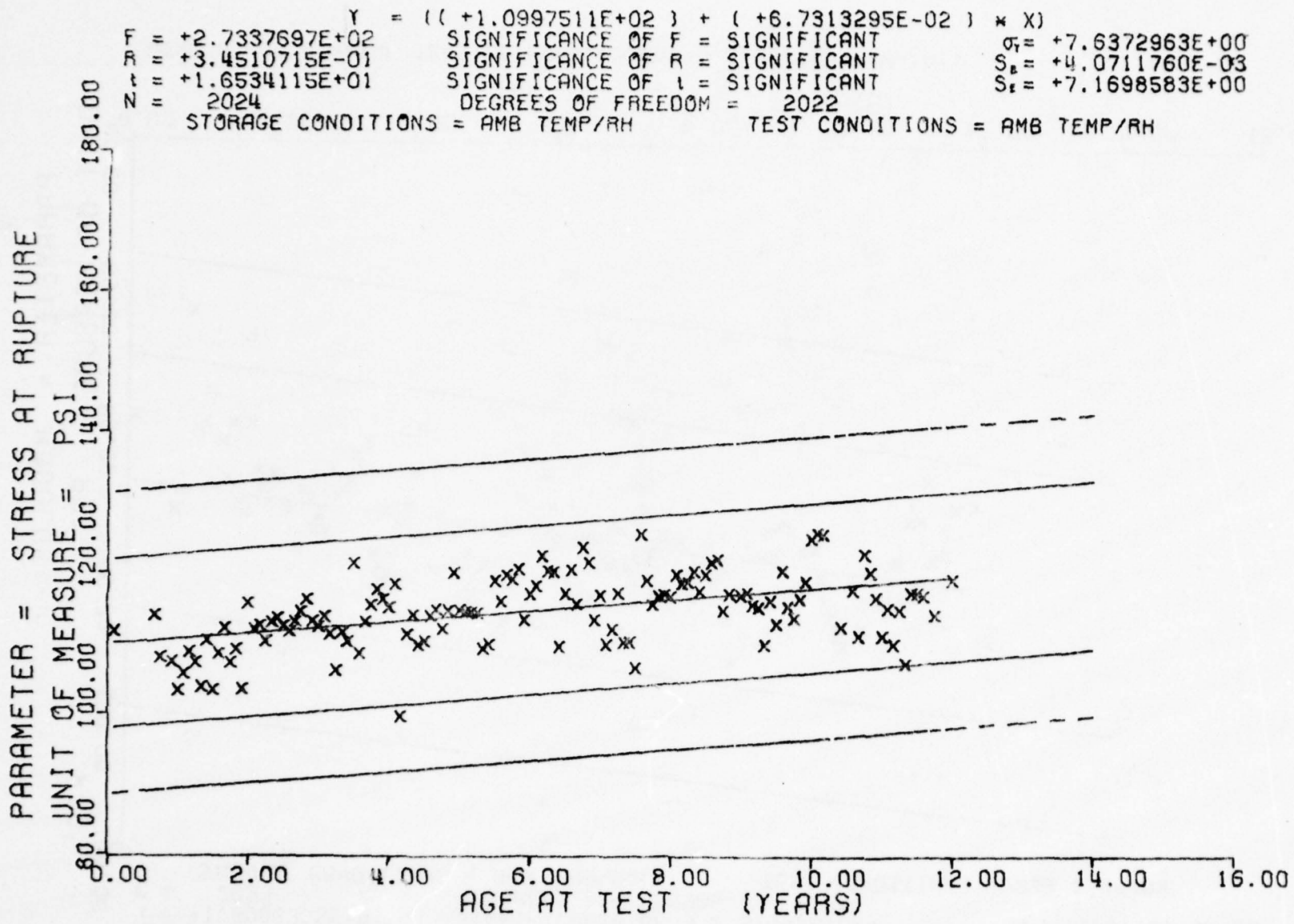

Y = ((+1.0997511E+02) + (+6.7313295E-02) * X)
F = +2.7337697E+02 SIGNIFICANCE OF F = SIGNIFICANT σr = +7.6372963E+00
R = +3.4510715E-01 SIGNIFICANCE OF R = SIGNIFICANT Sb = +4.0711760E-03
t = +1.6534115E+01 SIGNIFICANCE OF t = SIGNIFICANT Se = +7.1698583E+00
N = 2024 DEGREES OF FREEDOM = 2022
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRESS AT RUPTURE
UNIT OF MEASURE = PSI
80.00
100.00
120.00
140.00
160.00
180.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.BIAXIAL TENSILE,STRESS AT RUPTURE,CHS=0.2 IN/MIN TPH-1011

Figure 9

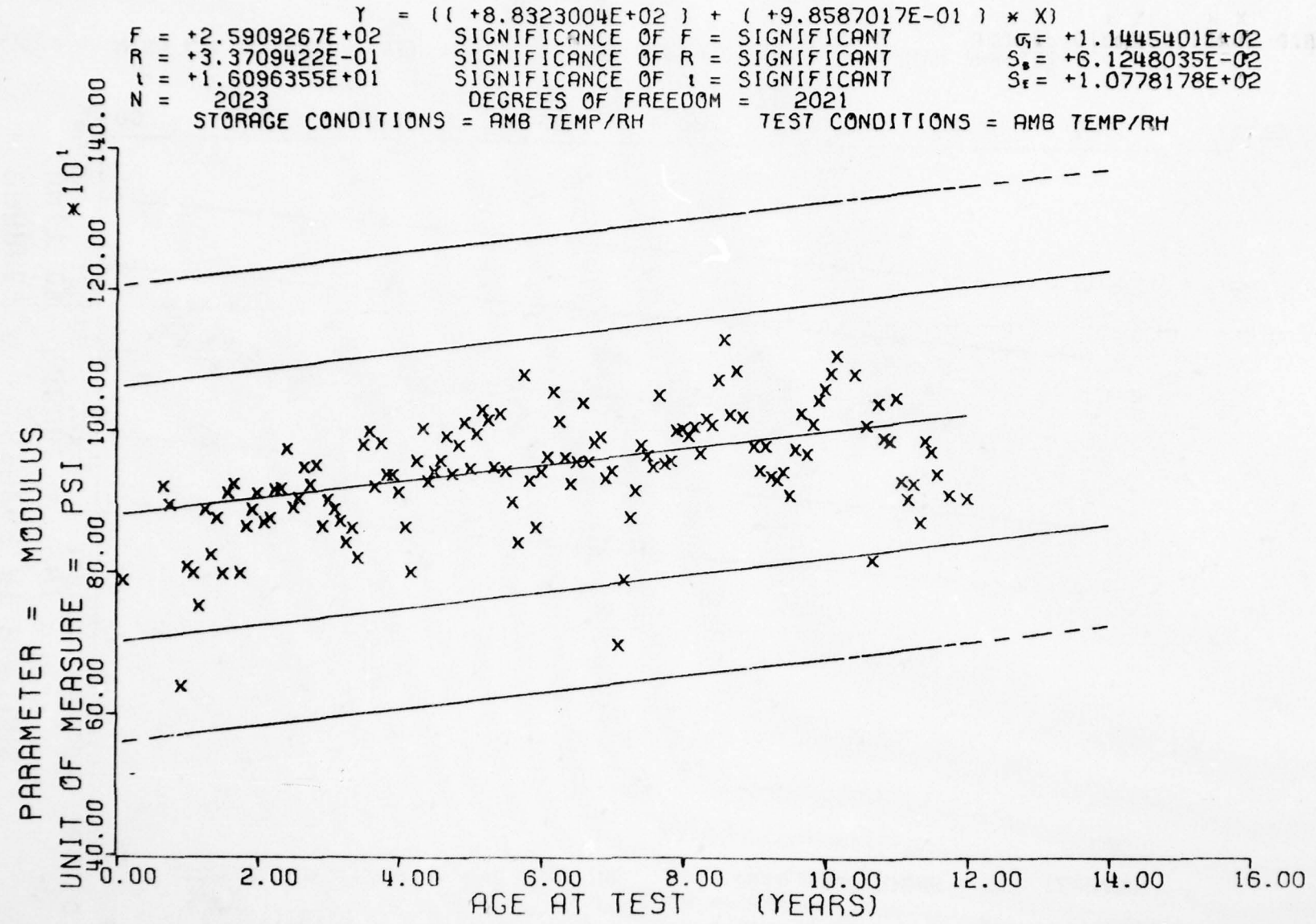

Y = ((+8.8323004E+02) + (+9.8587017E-01) * X)
F = +2.5909267E+02 SIGNIFICANCE OF F = SIGNIFICANT
R = +3.3709422E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +1.6096355E+01 SIGNIFICANCE OF t = SIGNIFICANT
N = 2023 DEGREES OF FREEDOM = 2021
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MODULUS
UNIT OF MEASURE = PSI *10¹
40.00
60.00
80.00
100.00
120.00
140.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.BIAXIAL TENSILE,MODULUS,CHS=0.2 IN/MIN TPH-1011

Figure 10

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES	AGE MONTHS	NR SAMPLES
2.0	3	28.0	82	53.0	76	78.0	162	103	35	128	45
4.0	57	29.0	55	54.0	77	79.0	117	104	45	129	33
5.0	151	30.0	52	55.0	137	80.0	114	105	9	130	234
6.0	191	31.0	52	56.0	91	81.0	127	106	6	131	111
7.0	171	32.0	124	57.0	145	82.0	63	107	15	132	12
8.0	143	33.0	85	58.0	134	83.0	82	108	72	133	18
9.0	194	34.0	78	59.0	102	84.0	33	109	97	134	81
10.0	189	35.0	41	60.0	108	85.0	23	110	41	135	14
11.0	192	36.0	148	61.0	150	86.0	38	111	24	136	27
12.0	220	37.0	77	62.0	185	87.0	135	112	65	137	63
13.0	204	38.0	36	63.0	253	88.0	114	113	100	138	246
14.0	216	39.0	72	64.0	98	89.0	107	114	65	139	132
15.0	223	40.0	59	65.0	58	90.0	60	115	51	140	9
16.0	209	41.0	32	66.0	40	91.0	58	116	258	142	1
17.0	184	42.0	66	67.0	64	92.0	62	117	240	143	4
18.0	26	43.0	75	68.0	50	93.0	64	118	143	144	3
19.0	60	44.0	15	69.0	73	94.0	104	119	117		
20.0	18	45.0	20	70.0	120	95.0	114	120	216		
21.0	78	46.0	55	71.0	75	96.0	192	121	93		
22.0	43	47.0	79	72.0	119	97.0	193	122	24		
23.0	30	48.0	40	73.0	129	98.0	185	123	30		
24.0	77	49.0	77	74.0	157	99.0	123	124	27		
25.0	51	50.0	93	75.0	175	100.0	53	125	42		
26.0	56	51.0	154	76.0	134	101.0	76	126	72		
27.0	59	52.0	196	77.0	145	102.0	13	127	57		

WING 6.L.R.TENSILE.STRAIN AT MAX STRESS.CHS=2.0 IN/MIN TP-H1011

This sample size summary is applicable to Figures 11 thru 15.

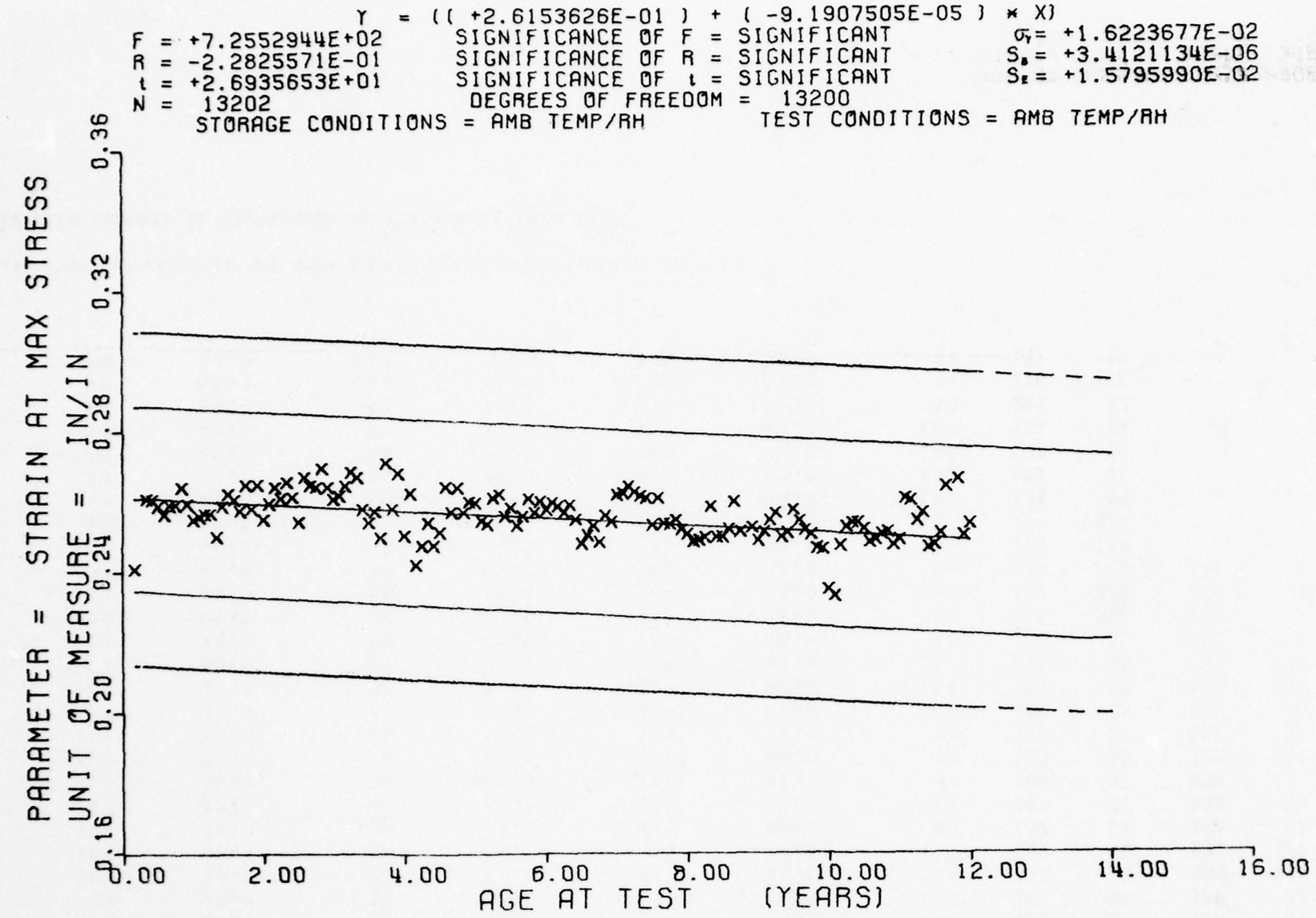

Y = ((+2.6153626E-01) + (-9.1907505E-05) * X)
F = +7.2552944E+02
SIGNIFICANCE OF F = SIGNIFICANT
σY = +1.6223677E-02
R = -2.2825571E-01
SIGNIFICANCE OF R = SIGNIFICANT
Sa = +3.4121134E-06
t = +2.6935653E+01
SIGNIFICANCE OF t = SIGNIFICANT
Sε = +1.5795990E-02
N = 13202
DEGREES OF FREEDOM = 13200
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT MAX STRESS
UNIT OF MEASURE = IN/IN
0.16
0.20
0.24
0.28
0.32
0.36
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.TENSILE,STRAIN AT MAX STRESS,CHS=2.0 IN/MIN TP-H1011

Figure 11

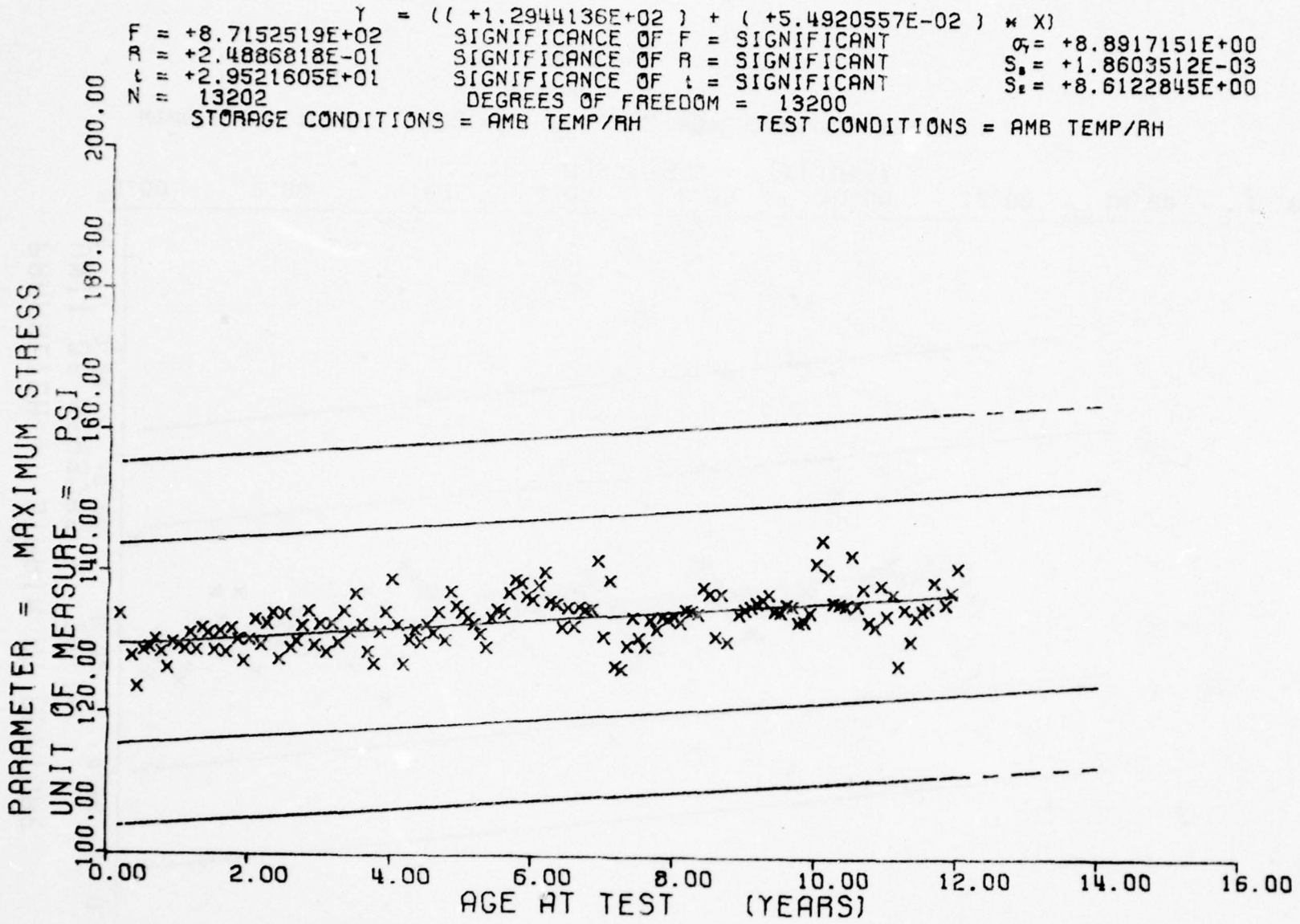

Y = ((+1.2944136E+02) + (+5.4920557E-02) * X)
F = +8.7152519E+02
R = +2.4886818E-01
t = +2.9521605E+01
N = 13202
SIGNIFICANCE OF F = SIGNIFICANT
SIGNIFICANCE OF R = SIGNIFICANT
SIGNIFICANCE OF t = SIGNIFICANT
DEGREES OF FREEDOM = 13200
σY = +8.8917151E+00
Sb = +1.8603512E-03
Sε = +8.6122845E+00
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MAXIMUM STRESS
UNIT OF MEASURE = PSI
100.00
120.00
140.00
160.00
180.00
200.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.A.TENSILE,MAXIMUM STRESS,CHS=2.0 IN/MIN TP-H1011

Figure 12

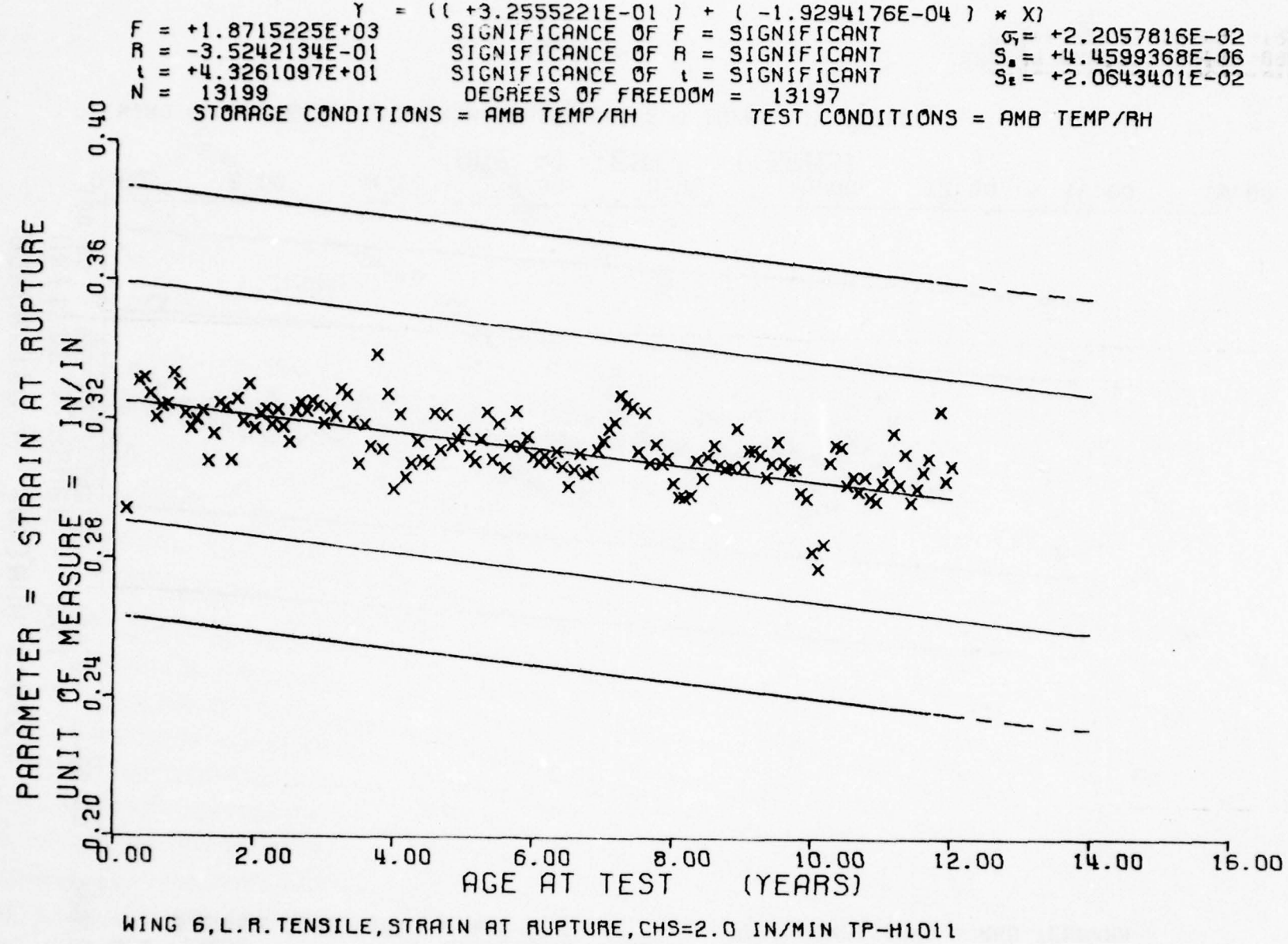

Y = ((+3.2555221E-01) + (-1.9294176E-04) * X)
F = +1.8715225E+03 SIGNIFICANCE OF F = SIGNIFICANT σ = +2.2057816E-02
R = -3.5242134E-01 SIGNIFICANCE OF R = SIGNIFICANT S = +4.4599368E-06
t = +4.3261097E+01 SIGNIFICANCE OF t = SIGNIFICANT S = +2.0643401E-02
N = 13199 DEGREES OF FREEDOM = 13197
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT RUPTURE
UNIT OF MEASURE = IN/IN
0.40
0.36
0.32
0.28
0.24
0.20
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.TENSILE,STRAIN AT RUPTURE,CHS=2.0 IN/MIN TP-H1011

Figure 13

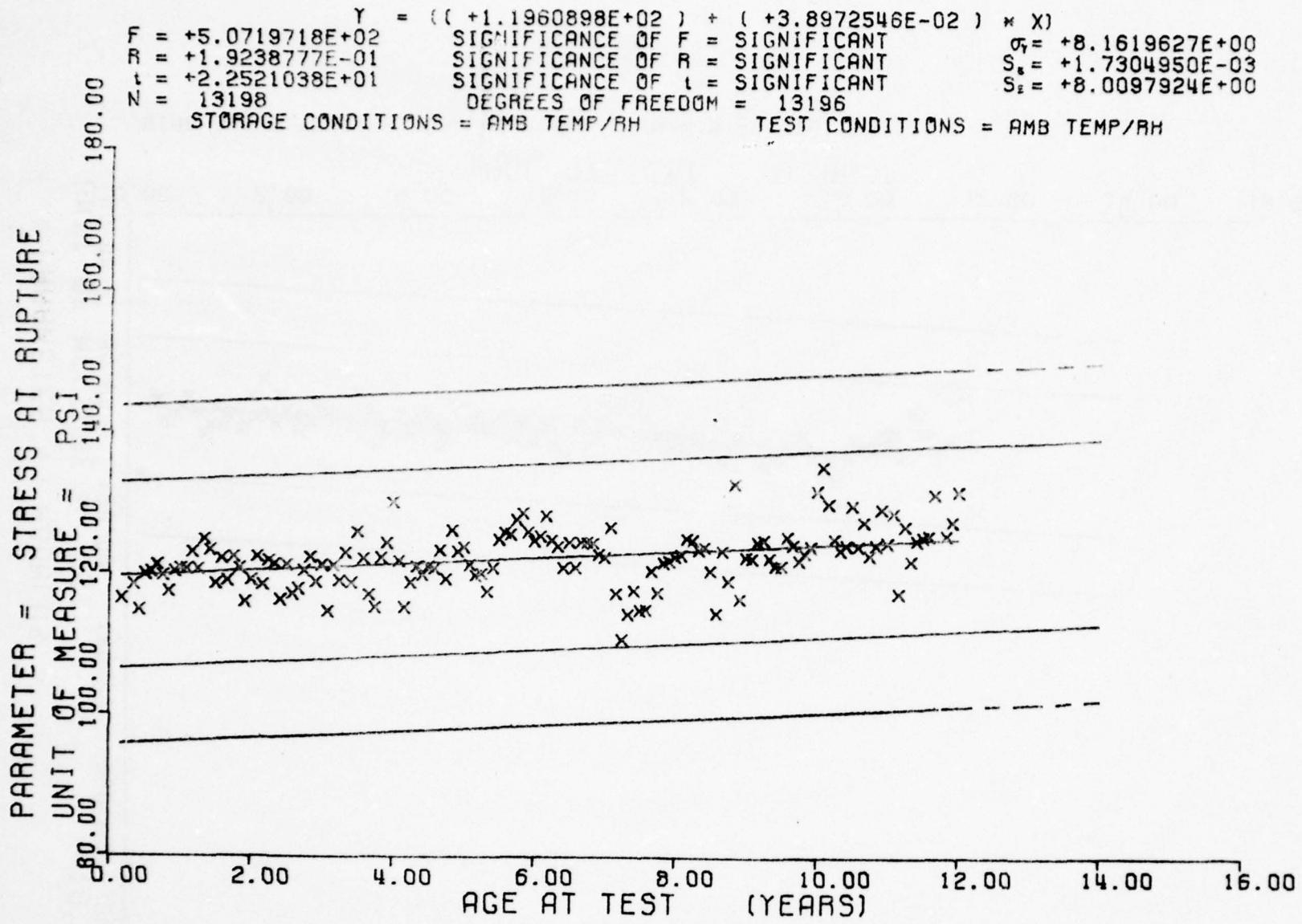

Y = ((+1.1960898E+02) + (+3.8972546E-02) * X)
F = +5.0719718E+02 SIGNIFICANCE OF F = SIGNIFICANT
R = +1.9238777E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +2.2521038E+01 SIGNIFICANCE OF t = SIGNIFICANT
N = 13198 DEGREES OF FREEDOM = 13196
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
σy = +8.1619627E+00
Sb = +1.7304950E-03
Sε = +8.0097924E+00
PARAMETER = STRESS AT RUPTURE
UNIT OF MEASURE = PSI
80.00
100.00
120.00
140.00
160.00
180.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.R.TENSILE,STRESS AT RUPTURE,CHS=2.0 IN/MIN TP-H1011

Figure 14

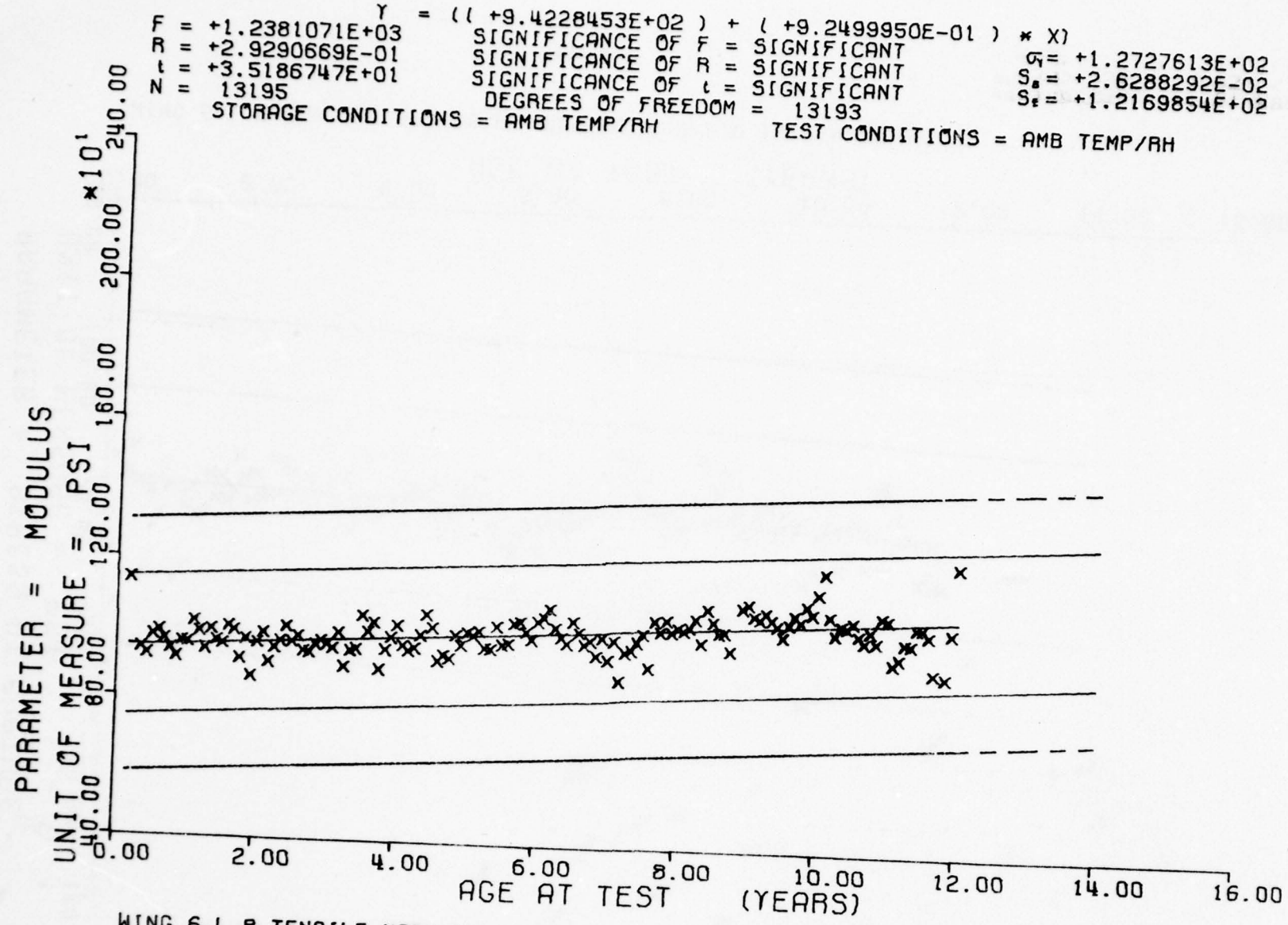

Y = ((+9.4228453E+02) + (+9.2499950E-01) * X)
F = +1.2381071E+03
R = +2.9290669E-01
t = +3.5186747E+01
N = 13195
SIGNIFICANCE OF F = SIGNIFICANT
SIGNIFICANCE OF R = SIGNIFICANT
SIGNIFICANCE OF t = SIGNIFICANT
DEGREES OF FREEDOM = 13193
σ = +1.2727613E+02
S_a = +2.6288292E-02
S_ε = +1.2169854E+02
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MODULUS
UNIT OF MEASURE = PSI *10^1
240.00
200.00
160.00
120.00
80.00
40.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,L.A.TENSILE,MODULUS,CHS=2.0 IN/MIN TP-H1011

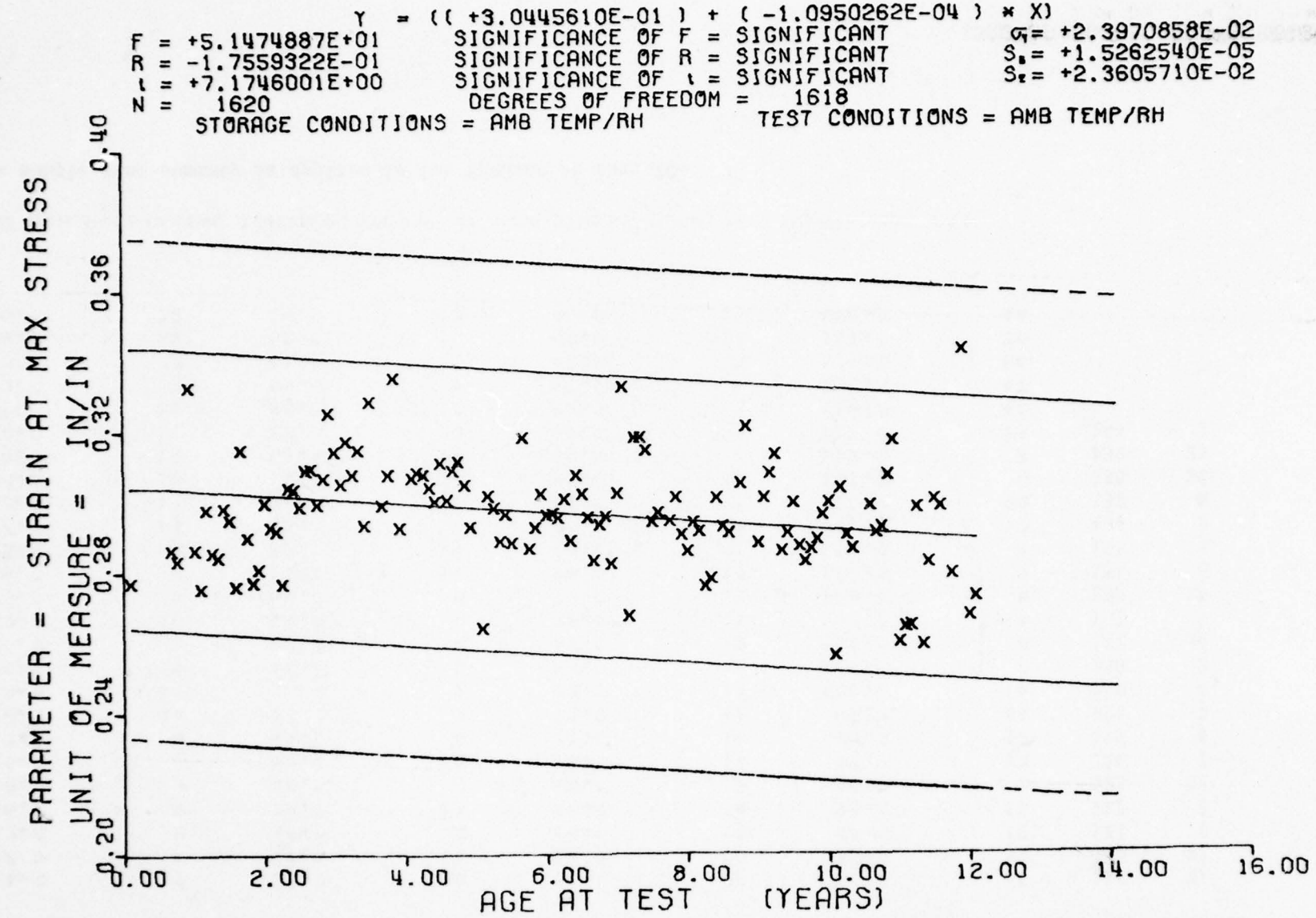
Figure 15

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
1.0	2	36.0	20	64.0	20	91.0	10	119	21
12.0	4	37.0	14	65.0	20	93.0	12	120	37
13.0	8	38.0	9	66.0	10	94.0	10	121	2
14.0	2	39.0	11	68.0	4	95.0	10	122	8
15.0	2	40.0	9	69.0	2	96.0	8	123	12
16.0	8	41.0	6	70.0	10	97.0	13	124	2
17.0	4	42.0	4	71.0	14	98.0	12	127	6
18.0	14	44.0	2	72.0	12	99.0	24	128	2
19.0	11	45.0	2	73.0	18	100.0	14	129	4
20.0	20	46.0	2	74.0	20	101.0	8	130	8
21.0	4	47.0	4	75.0	12	102.0	8	131	14
22.0	10	49.0	4	76.0	16	103.0	4	132	39
23.0	6	50.0	8	77.0	12	105.0	6	133	24
24.0	8	51.0	16	78.0	10	106.0	4	134	6
25.0	23	52.0	24	79.0	21	108.0	4	135	4
26.0	13	53.0	26	80.0	12	109.0	13	136	2
27.0	11	54.0	6	81.0	7	110.0	28	137	6
28.0	17	55.0	26	82.0	14	111.0	8	138	35
29.0	14	56.0	12	83.0	4	112.0	2	139	25
30.0	18	57.0	22	84.0	2	113.0	14	144	2
31.0	16	58.0	12	86.0	3	114.0	41		
32.0	23	59.0	5	87.0	6	115.0	47		
33.0	23	61.0	5	88.0	8	116.0	54		
34.0	22	62.0	12	89.0	11	117.0	38		
35.0	22	63.0	13	90.0	13	118.0	16		

WING 6,H.R.TRIAXIAL TENSILE,STRAIN AT MAX STRESS,CHS=1750 IN/MIN,900 PSI

This sample size summary is applicable for figures 16 thru 20.



WING 6,H.R.TRIAXIAL TENSILE,STRAIN AT MAX STRESS,CHS=1750 IN/MIN,800 PSI

Figure 16

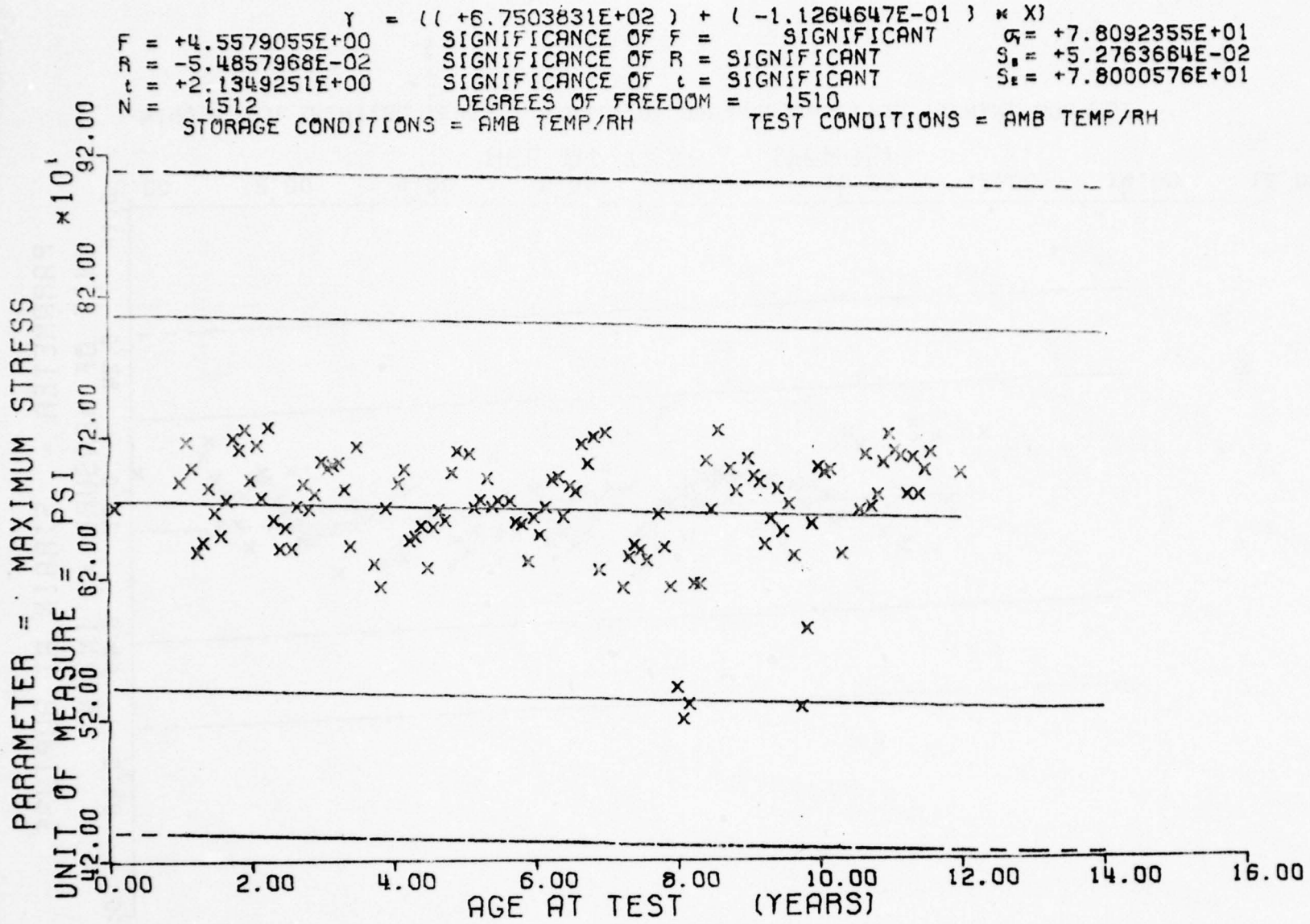

Y = ((+6.7503831E+02) + (-1.1264647E-01) * X)
F = +4.5579055E+00 SIGNIFICANCE OF F = SIGNIFICANT σ = +7.8092355E+01
R = -5.4857968E-02 SIGNIFICANCE OF R = SIGNIFICANT S_B = +5.2763664E-02
t = +2.1349251E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +7.8000576E+01
N = 1512 DEGREES OF FREEDOM = 1510
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MAXIMUM STRESS
UNIT OF MEASURE = PSI x10^1
92.00
82.00
72.00
62.00
52.00
42.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.TRIAXIAL TENSILE,MAXIMUM STRESS,CHS=1750 IN/MIN, 800 PSI

Figure 17

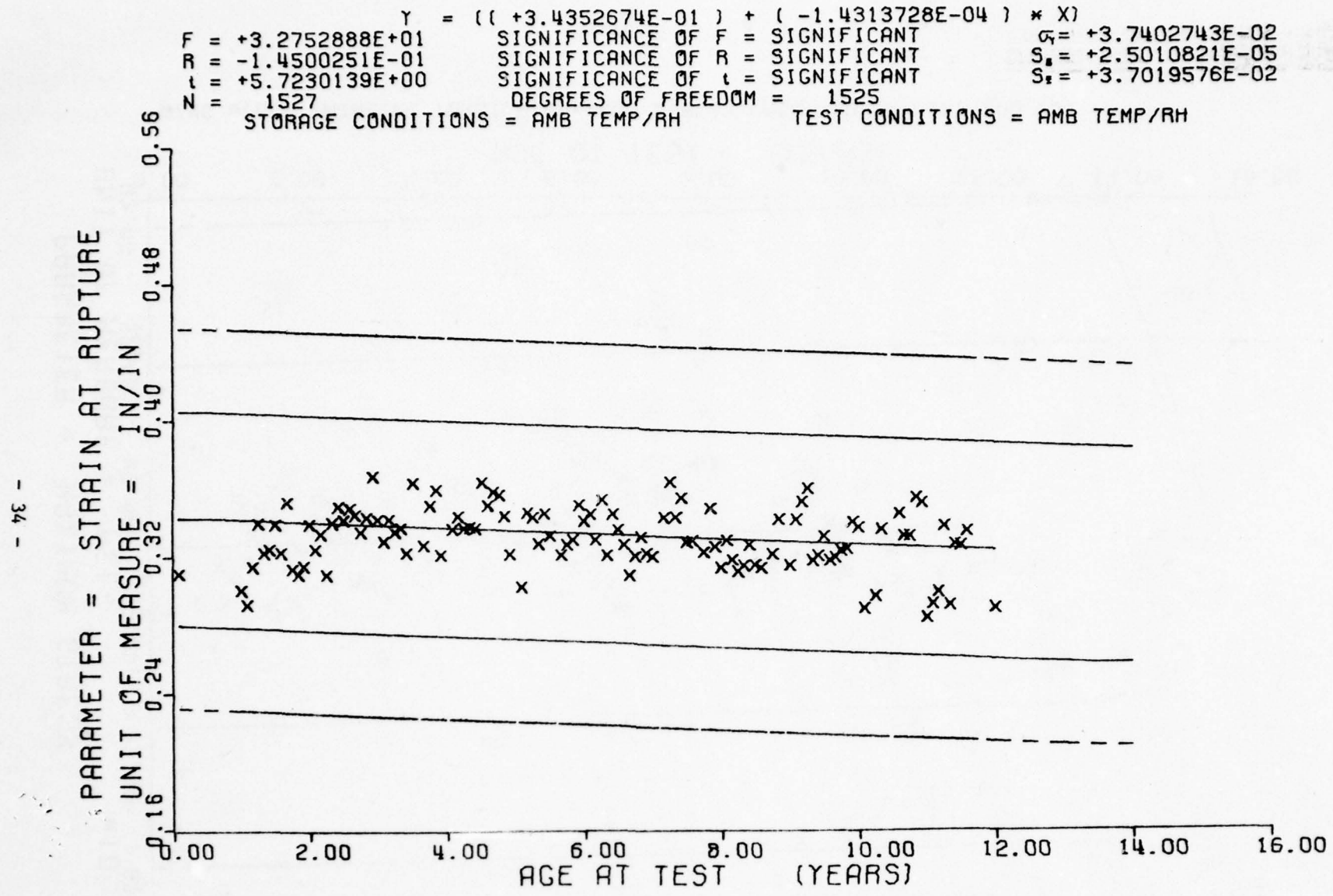

Y = ((+3.4352674E-01) + (-1.4313728E-04) * X)
F = +3.2752888E+01 SIGNIFICANCE OF F = SIGNIFICANT σ = +3.7402743E-02
R = -1.4500251E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +2.5010821E-05
t = +5.7230139E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +3.7019576E-02
N = 1527 DEGREES OF FREEDOM = 1525
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT RUPTURE
UNIT OF MEASURE = IN/IN
0.56
0.48
0.40
0.32
0.24
0.16
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.TRIAXIAL TENSILE,STRAIN AT RUPTURE,CHS=1750 IN/MIN, 800 PSI

Figure 18

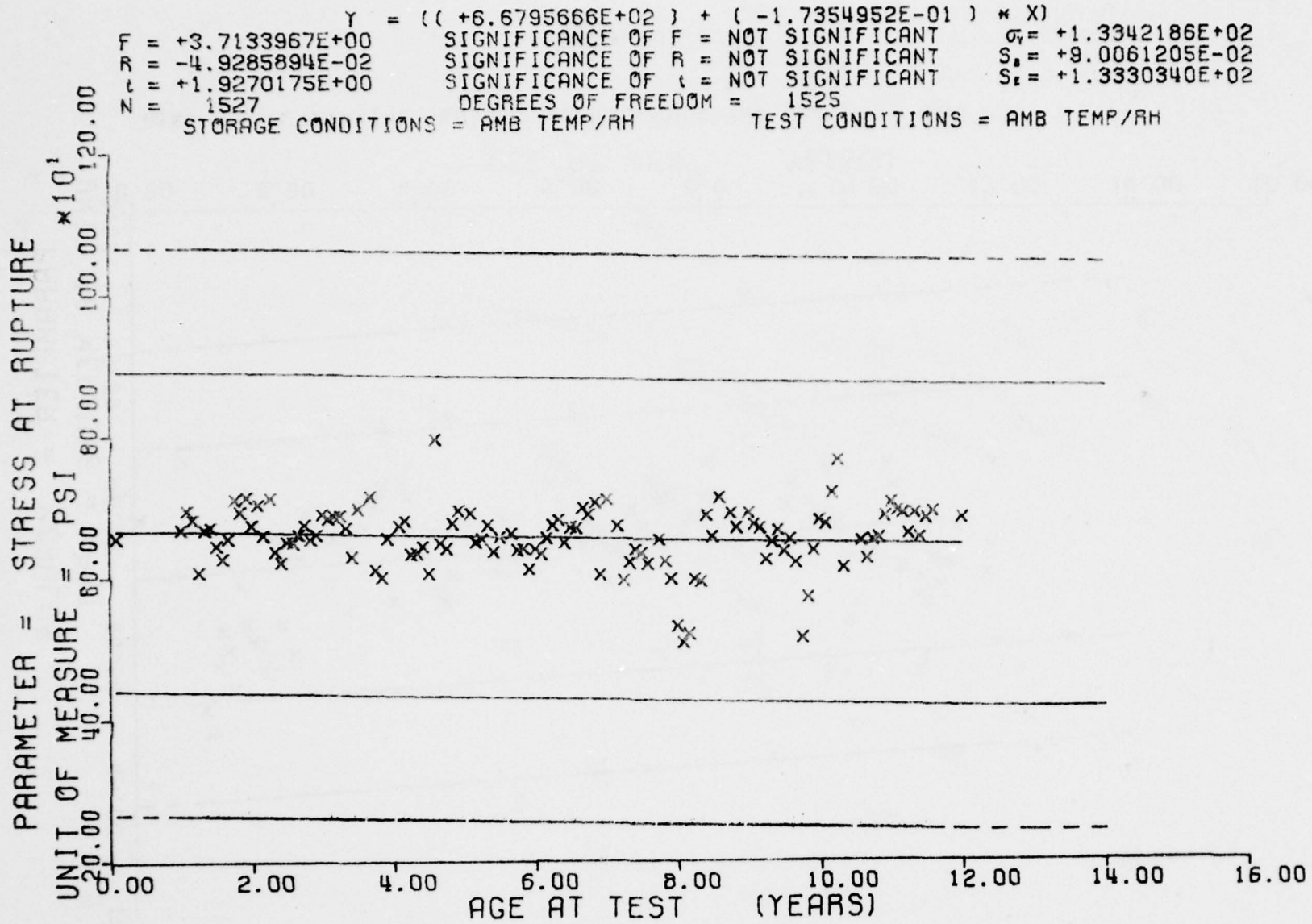

Y = ((+6.6795666E+02) + (-1.7354952E-01) * X)
F = +3.7133967E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT σy = +1.3342186E+02
R = -4.9285894E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT Sa = +9.0061205E-02
t = +1.9270175E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT Sε = +1.3330340E+02
N = 1527 DEGREES OF FREEDOM = 1525
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRESS AT RUPTURE
UNIT OF MEASURE = PSI *10¹
120.00
100.00
80.00
60.00
40.00
20.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.TRIAXIAL TENSILE,STRESS AT RUPTURE,CHS=1750 IN/MIN, 800 PSI

Figure 19

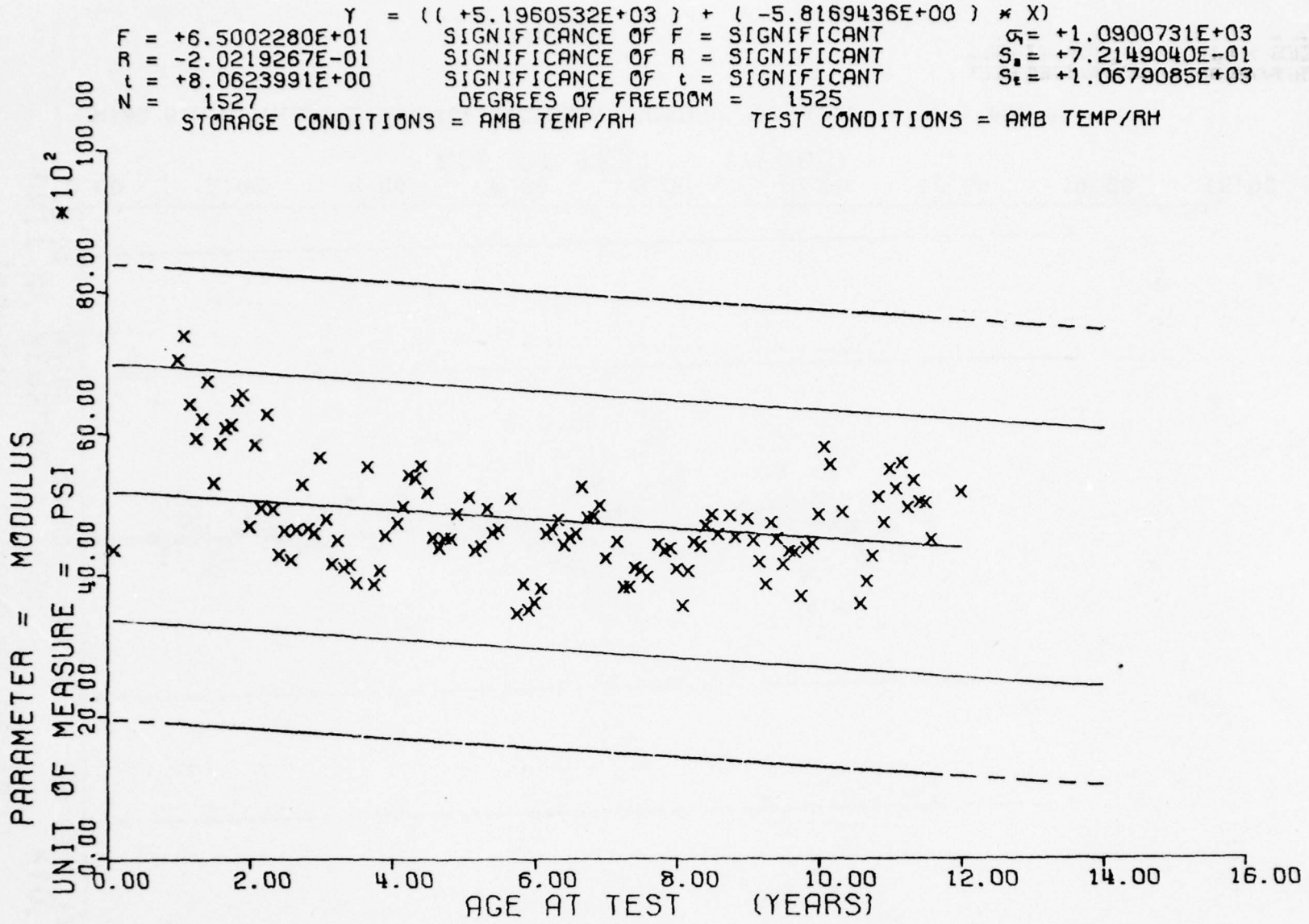

Y = ((+5.1960532E+03) + (-5.8169436E+00) * X)
F = +6.5002280E+01 SIGNIFICANCE OF F = SIGNIFICANT σ = +1.0900731E+03
R = -2.0219267E-01 SIGNIFICANCE OF R = SIGNIFICANT S = +7.2149040E-01
t = +8.0623991E+00 SIGNIFICANCE OF t = SIGNIFICANT S = +1.0679085E+03
N = 1527 DEGREES OF FREEDOM = 1525
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MODULUS
UNIT OF MEASURE = PSI *10²
100.00
80.00
60.00
40.00
20.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.TRIAXIAL TENSILE,MODULUS,CHS=1750 IN/MIN AT 800 PSI

Figure 20

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
12.0	4	37.0	24	64.0	19	92.0	14	117	112
13.0	8	38.0	22	65.0	27	93.0	22	118	25
14.0	2	39.0	20	68.0	18	94.0	24	119	34
15.0	8	40.0	9	69.0	27	95.0	16	120	44
16.0	8	41.0	17	70.0	27	96.0	19	121	17
17.0	12	42.0	7	71.0	24	97.0	26	122	2
18.0	14	43.0	5	72.0	11	98.0	19	123	15
19.0	4	44.0	10	73.0	44	99.0	13	124	14
20.0	4	45.0	5	74.0	40	100.0	8	125	30
21.0	24	46.0	5	75.0	28	101.0	19	126	12
22.0	4	49.0	8	76.0	19	102.0	7	127	24
23.0	2	50.0	11	77.0	17	103.0	5	128	24
24.0	17	51.0	35	78.0	27	104.0	16	129	8
25.0	24	52.0	65	79.0	61	105.0	5	130	17
26.0	12	53.0	34	80.0	16	106.0	9	131	26
27.0	29	54.0	10	81.0	6	107.0	10	132	22
28.0	20	55.0	37	82.0	30	108.0	2	133	2
29.0	37	56.0	41	83.0	15	109.0	21	134	28
30.0	28	57.0	48	85.0	5	110.0	36	135	7
31.0	29	58.0	40	86.0	5	111.0	17	136	5
32.0	42	59.0	4	87.0	21	112.0	6	137	10
33.0	25	60.0	8	88.0	15	113.0	79	138	49
34.0	21	61.0	17	89.0	40	114.0	49	139	59
35.0	5	62.0	40	90.0	40	115.0	21	140	4
36.0	20	63.0	84	91.0	15	116.0	32	141	2
								144	4

WING 6,H.R.HYDROSTATIC,STRAIN AT MAX STRESS,175CIN/MIN,80C PSI

This sample size summary is applicable to figures 21 thru 25.

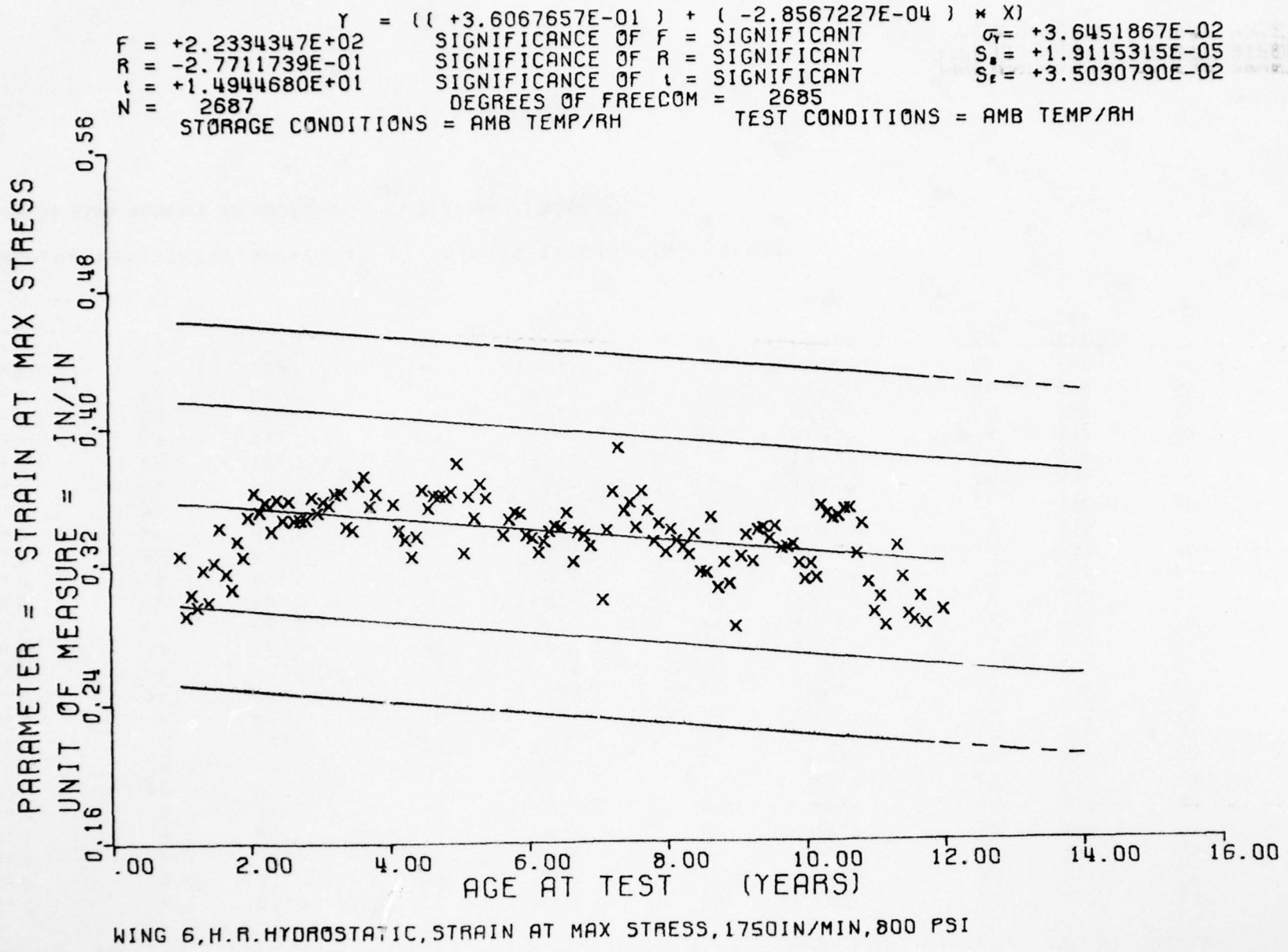

Y = ((+3.6067657E-01) + (-2.8567227E-04) * X)
F = +2.2334347E+02 SIGNIFICANCE OF F = SIGNIFICANT
R = -2.7711739E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +1.4944680E+01 SIGNIFICANCE OF t = SIGNIFICANT
N = 2687 DEGREES OF FREECOM = 2685
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
σ = +3.6451867E-02
S_a = +1.9115315E-05
S_ε = +3.5030790E-02
PARAMETER = STRAIN AT MAX STRESS
UNIT OF MEASURE = IN/IN
0.16
0.24
0.32
0.40
0.48
0.56
.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.HYDROSTATIC,STRAIN AT MAX STRESS,1750IN/MIN,800 PSI

Figure 21

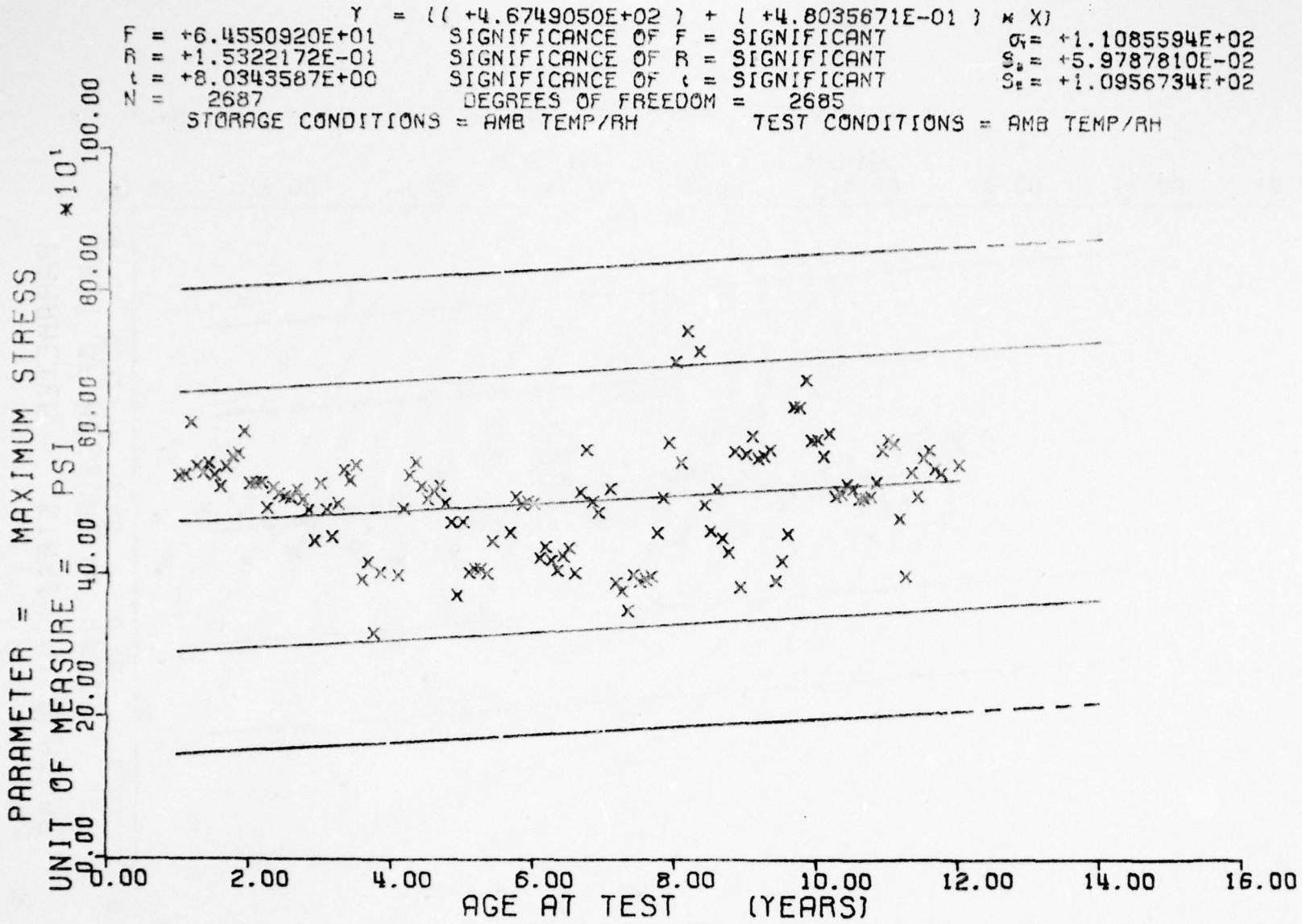

Y = ((+4.6749050E+02) + (+4.8035671E-01) * X)
F = +6.4550920E+01 SIGNIFICANCE OF F = SIGNIFICANT σ1 = +1.1085594E+02
R = +1.5322172E-01 SIGNIFICANCE OF R = SIGNIFICANT Sb = +5.9787810E-02
t = +8.0343587E+00 SIGNIFICANCE OF t = SIGNIFICANT Se = +1.0956734E+02
N = 2687 DEGREES OF FREEDOM = 2685
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MAXIMUM STRESS
UNIT OF MEASURE = PSI *10¹
100.00
80.00
60.00
40.00
20.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.HYDROSTATIC,MAXIMUM STRESS,1750IN/MIN,800 PSI

Figure 22

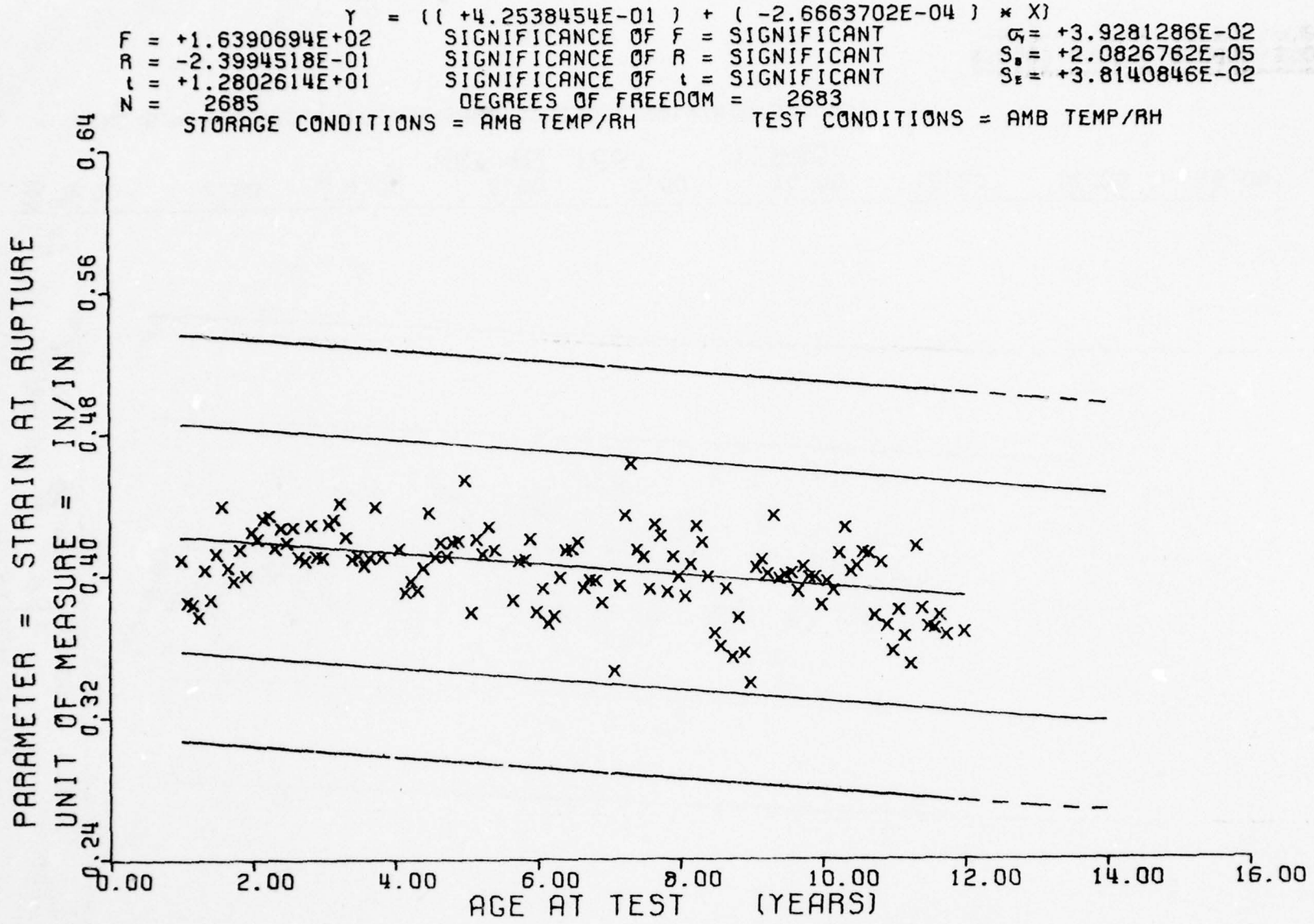
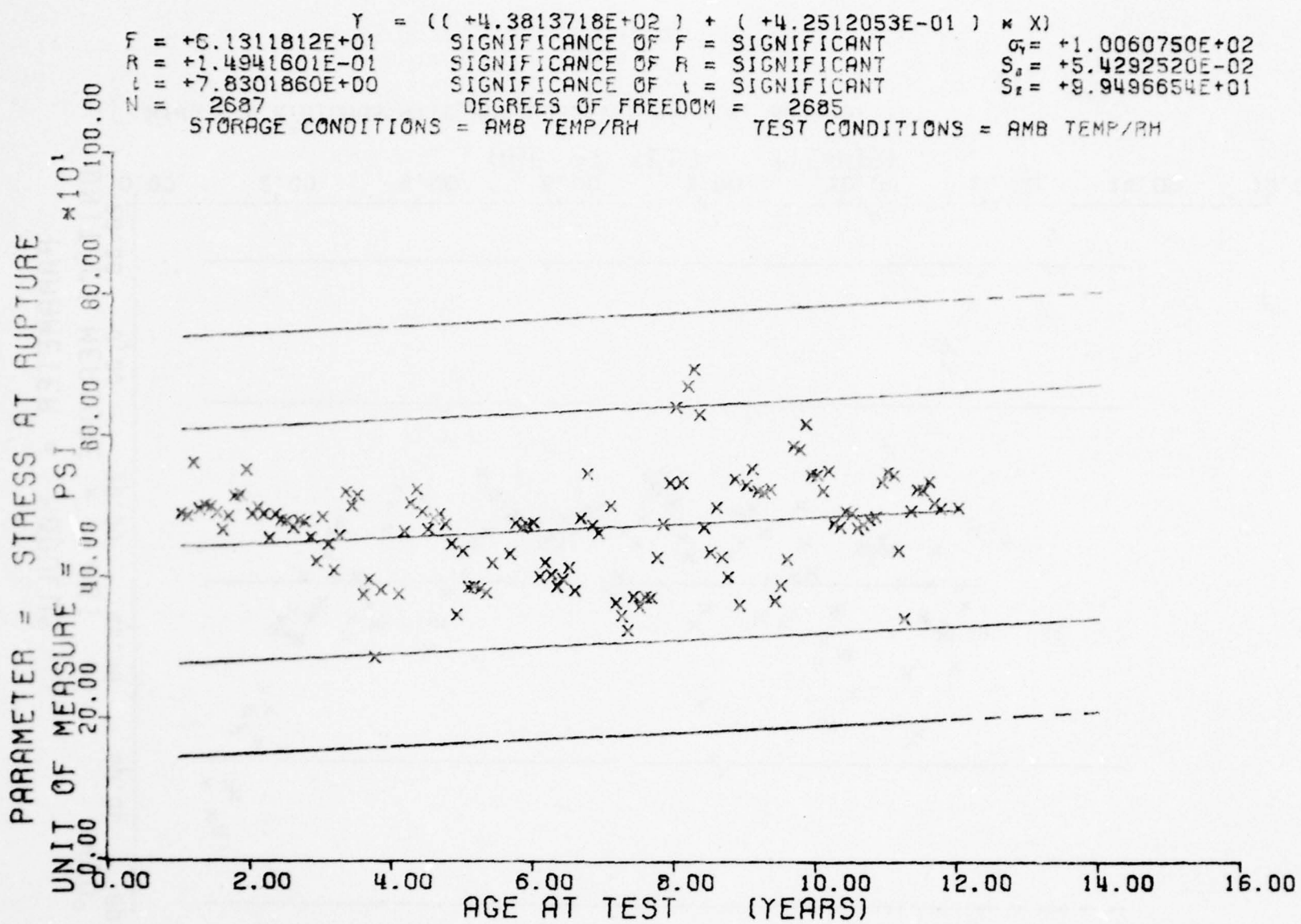

Y = ((+4.2538454E-01) + (-2.6663702E-04) * X)
F = +1.6390694E+02 SIGNIFICANCE OF F = SIGNIFICANT σ = +3.9281286E-02
R = -2.3994518E-01 SIGNIFICANCE OF R = SIGNIFICANT S = +2.0826762E-05
t = +1.2802614E+01 SIGNIFICANCE OF t = SIGNIFICANT S = +3.8140846E-02
N = 2685 DEGREES OF FREEDOM = 2683
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT RUPTURE
UNIT OF MEASURE = IN/IN
0.64
0.56
0.48
0.40
0.32
0.24
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.HYDROSTATIC,STRAIN AT RUPTURE,175OIN/MIN,800 PSI

Figure 23



WING 6,H.R.HYDROSTATIC,STRESS AT RUPTURE,1750IN/MIN,800 PSI

Figure 24

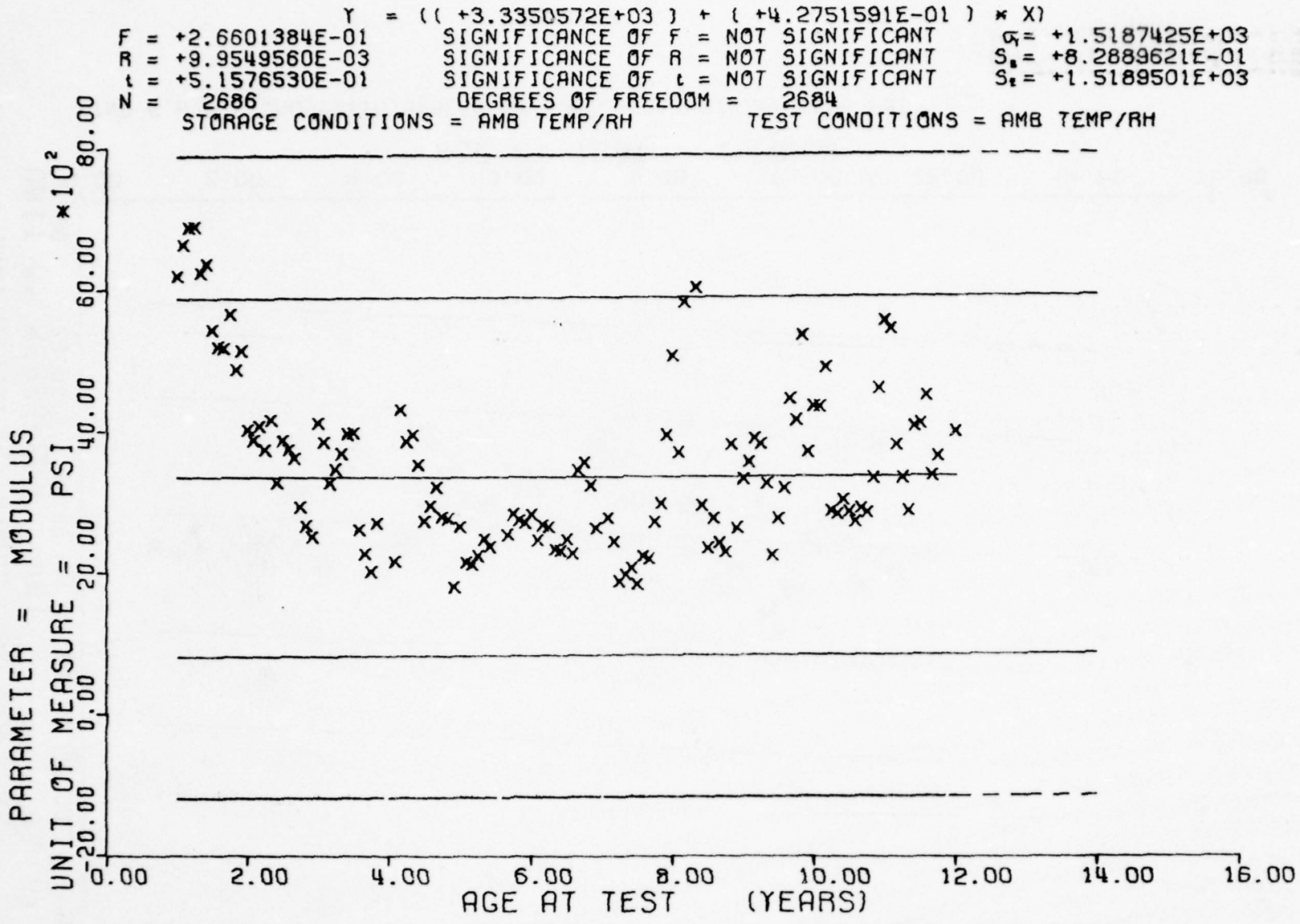

Y = ((+3.3350572E+03) + (+4.2751591E-01) * X)
F = +2.6601384E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT
R = +9.9549560E-03 SIGNIFICANCE OF R = NOT SIGNIFICANT
t = +5.1576530E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT
N = 2686 DEGREES OF FREEDOM = 2684
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = MODULUS
UNIT OF MEASURE = PSI *10²
80.00
60.00
40.00
20.00
0.00
-20.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,H.R.HYDROSTATIC,MODULUS,1750 IN/MIN, 800 PSI

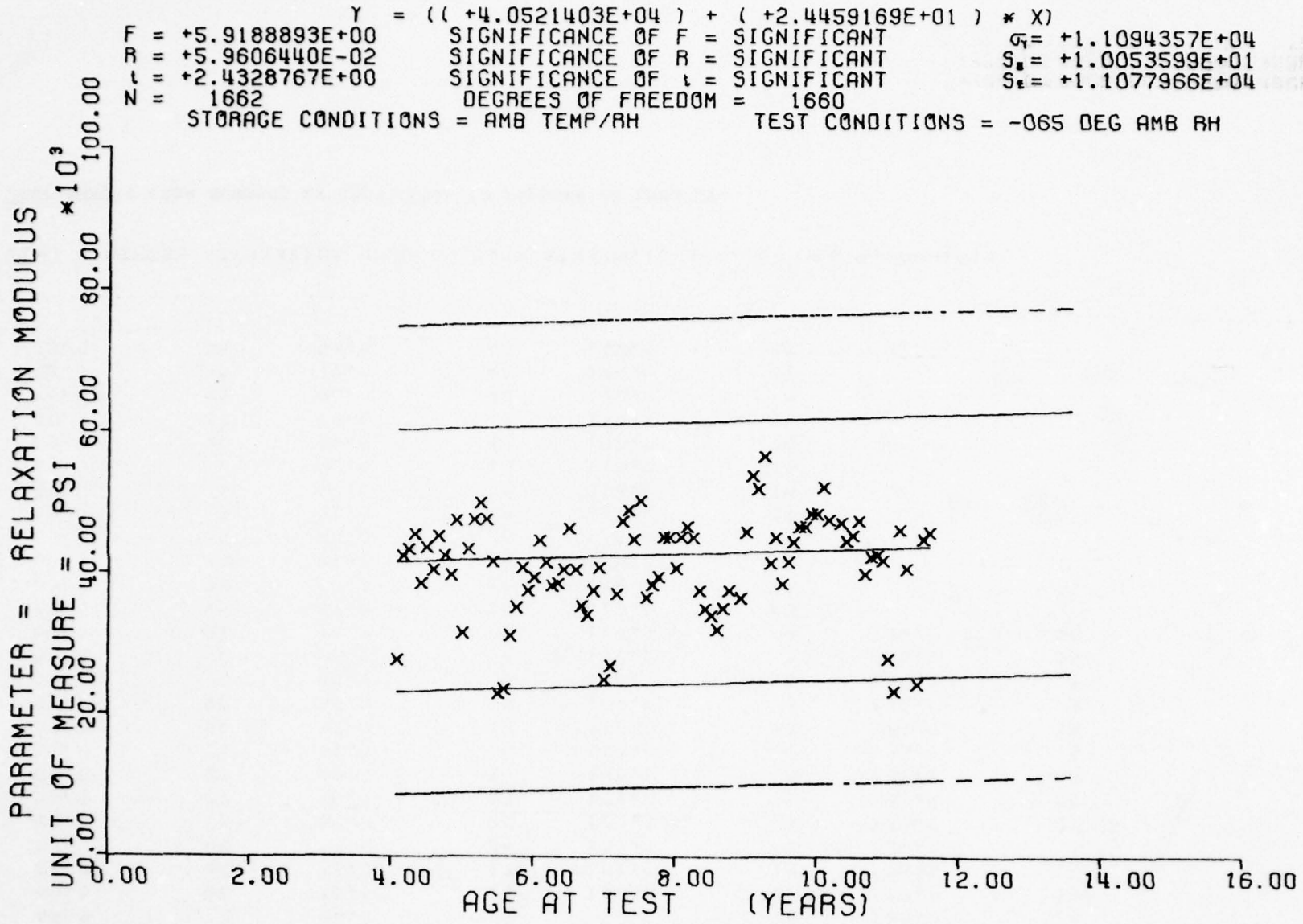
Figure 25

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
49.0	2	74.0	29	99.0	32	126.0	18
50.0	26	75.0	23	100.0	17	127.0	12
51.0	49	76.0	17	101.0	18	128.0	15
52.0	46	77.0	34	102.0	5	129.0	2
53.0	18	78.0	25	103.0	6	130.0	27
54.0	27	79.0	12	104.0	6	131.0	30
55.0	27	80.0	14	105.0	6	132.0	8
56.0	21	81.0	8	107.0	6	133.0	6
57.0	24	82.0	17	108.0	12	134.0	16
58.0	20	83.0	9	109.0	6	135.0	9
59.0	9	84.0	5	110.0	6	137.0	3
60.0	9	85.0	6	111.0	3	138.0	28
61.0	21	86.0	3	112.0	8	139.0	39
62.0	46	87.0	18	113.0	45		
63.0	23	88.0	16	114.0	30		
64.0	30	89.0	15	115.0	37		
65.0	9	90.0	6	116.0	30		
66.0	2	91.0	5	117.0	27		
67.0	9	92.0	6	118.0	15		
68.0	6	93.0	19	119.0	19		
69.0	20	94.0	17	120.0	30		
70.0	30	95.0	17	121.0	15		
71.0	41	96.0	42	122.0	3		
72.0	30	97.0	42	124.0	21		
73.0	36	98.0	40	125.0	17		

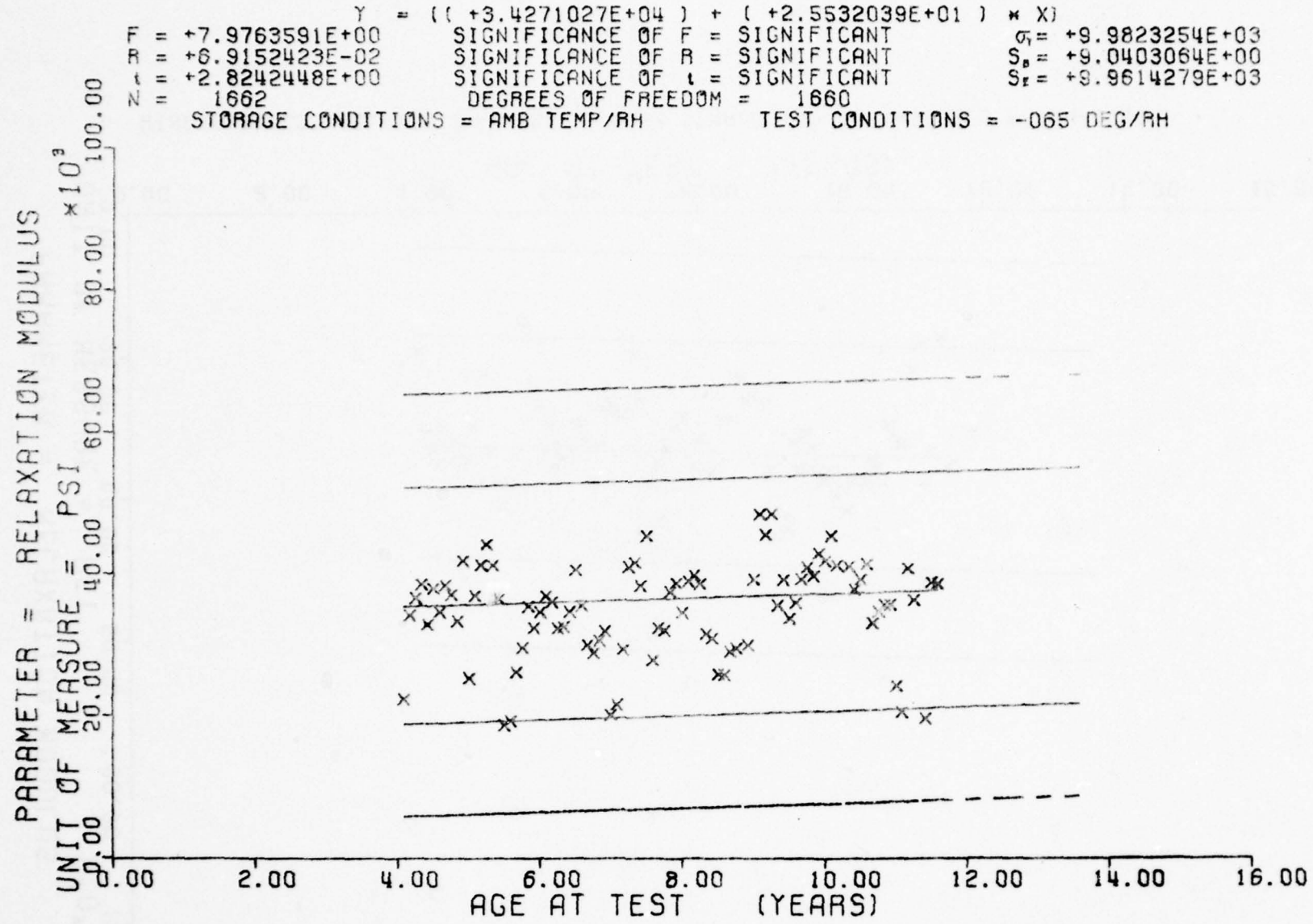
WING 6,STRESS RELAXATION MODULUS,C,5% STRAIN,10 SEC,-65 DEG F,TPH-1011

This sample size summary is applicable to figures 26 thru 29.



WING 6,STRESS RELAXATION MODULUS,0.5% STRAIN,10 SEC,-65 DEG F,TPH-1011

Figure 26



WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 50 SEC, -65 DEG F, TPH-1011

Figure 27

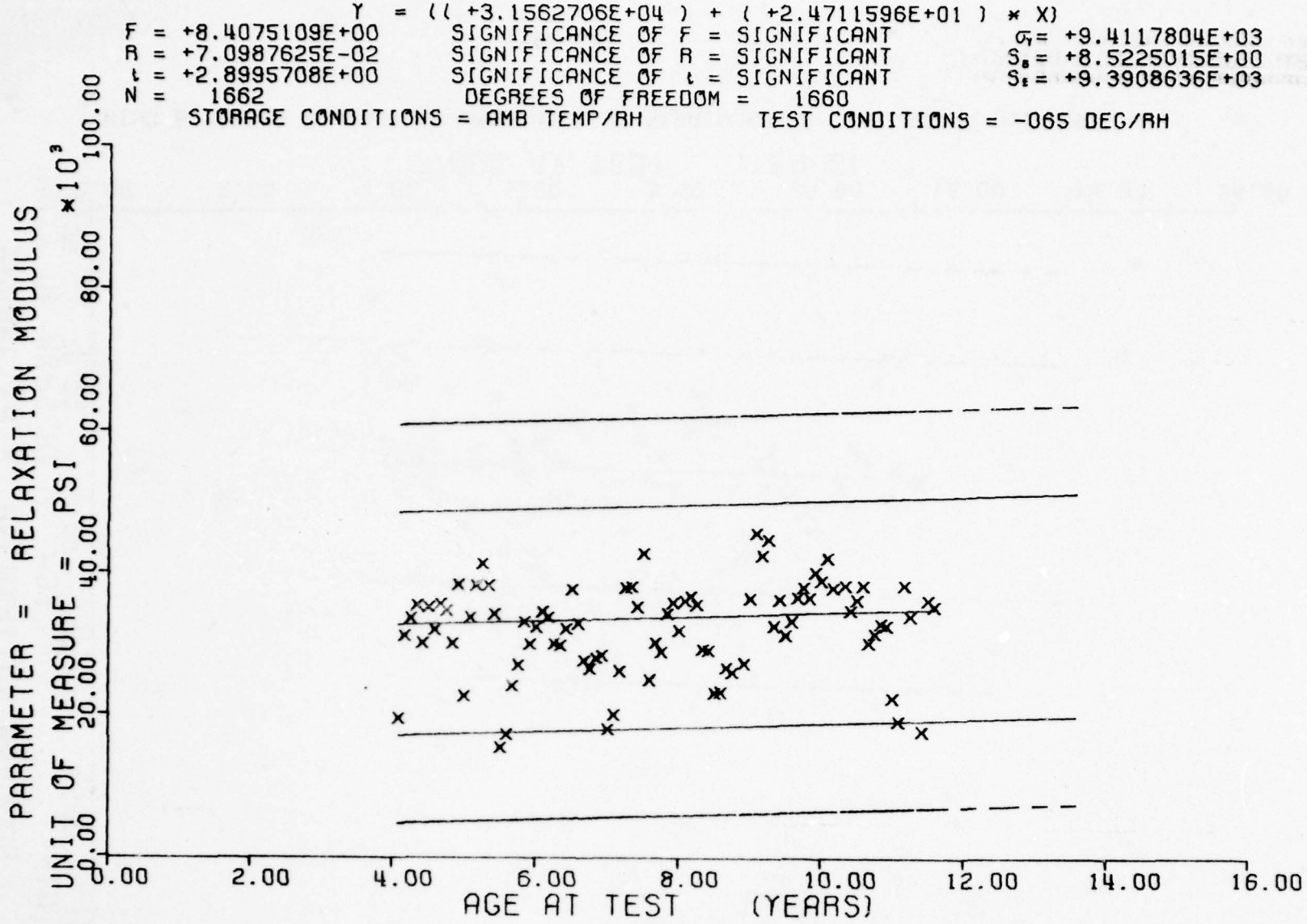
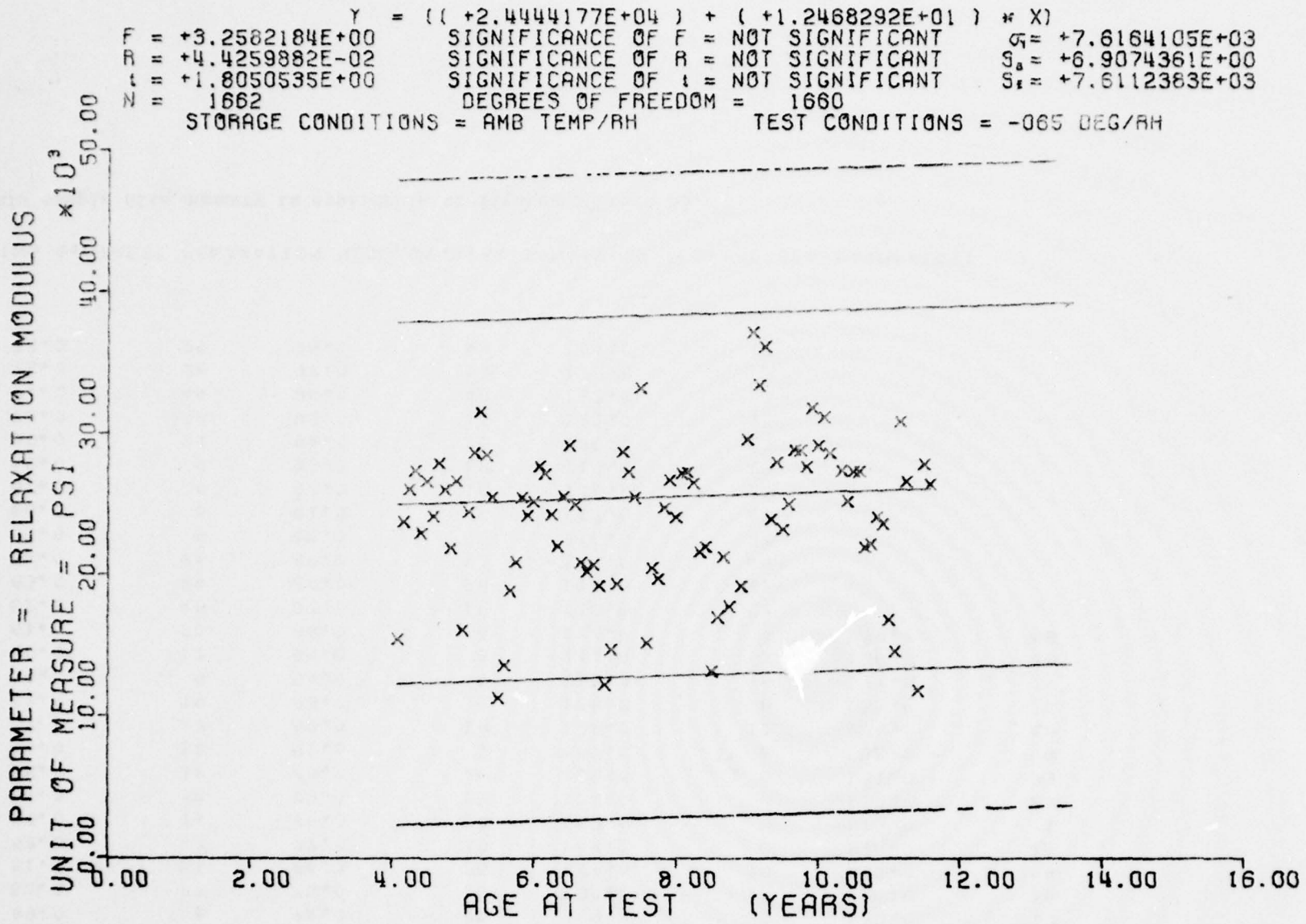

Y = ((+3.1562706E+04) + (+2.4711596E+01) * X)
F = +8.4075109E+00 SIGNIFICANCE OF F = SIGNIFICANT σ = +9.4117804E+03
R = +7.0987625E-02 SIGNIFICANCE OF R = SIGNIFICANT S = +8.5225015E+00
t = +2.8995708E+00 SIGNIFICANCE OF t = SIGNIFICANT S = +9.3908636E+03
N = 1662 DEGREES OF FREEDOM = 1660
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -065 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10³
0.00
20.00
40.00
60.00
80.00
100.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,0.5% STRAIN,100 SEC,-65 DEG F,TPH-1011

Figure 28



WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 1000 SEC, -65 DEG F, TPH-1011

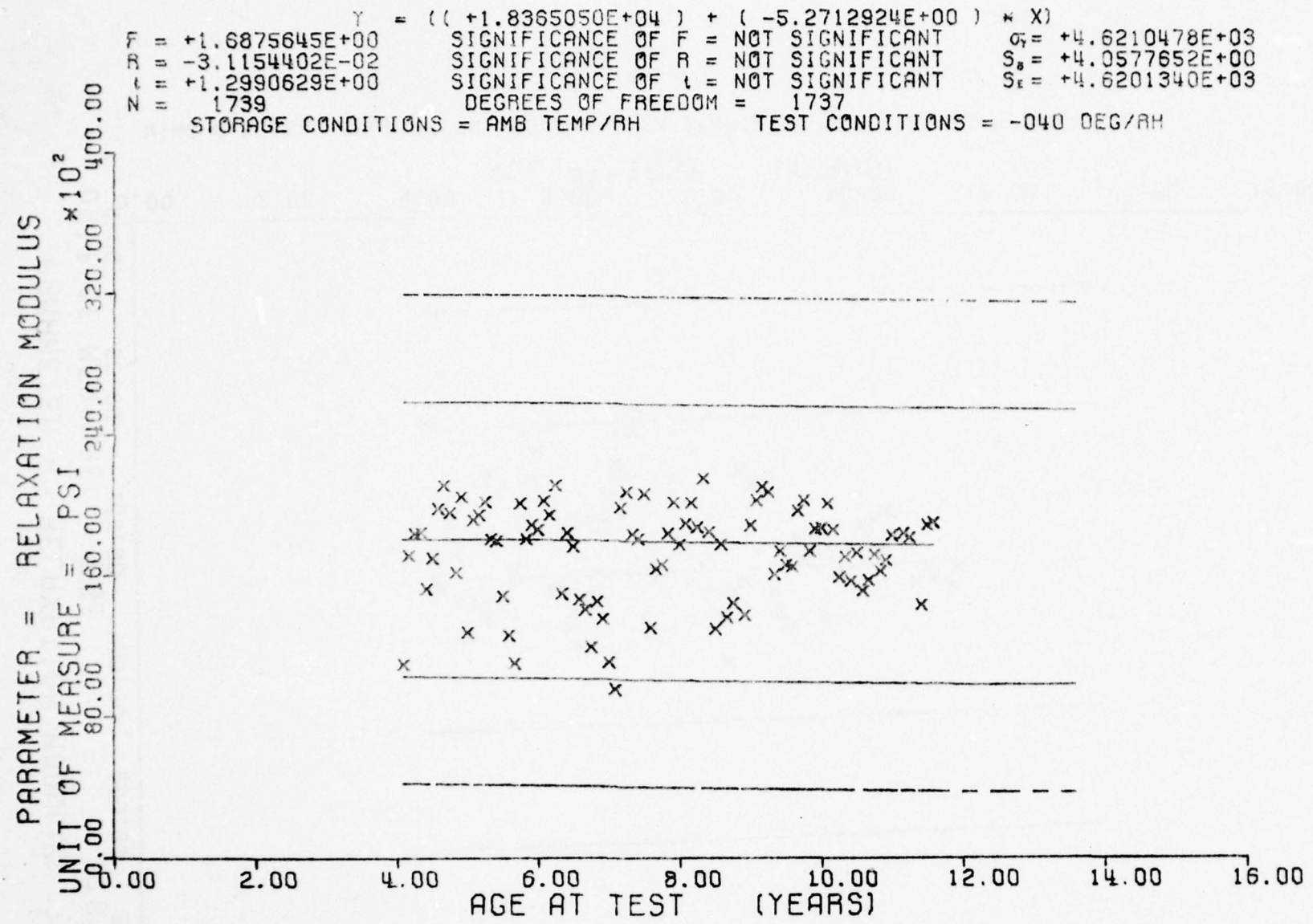
Figure 29

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
49.0	6	74.0	25	99.0	30	125.0	13
50.0	27	75.0	19	100.0	18	126.0	16
51.0	51	76.0	26	101.0	15	127.0	44
52.0	47	77.0	30	102.0	6	128.0	14
53.0	14	78.0	32	103.0	9	129.0	1
54.0	30	79.0	12	104.0	3	130.0	24
55.0	18	80.0	16	105.0	6	131.0	39
56.0	12	81.0	9	107.0	6	132.0	9
57.0	27	82.0	18	108.0	12	134.0	28
58.0	19	83.0	6	109.0	6	135.0	6
59.0	9	84.0	9	110.0	6	137.0	9
60.0	12	85.0	3	111.0	3	138.0	38
61.0	20	86.0	6	112.0	9	139.0	45
62.0	48	87.0	15	113.0	53		
63.0	24	88.0	20	114.0	31		
64.0	24	89.0	12	115.0	48		
65.0	9	90.0	5	116.0	37		
66.0	6	91.0	9	117.0	21		
67.0	6	92.0	15	118.0	15		
68.0	9	93.0	12	119.0	15		
69.0	21	94.0	16	120.0	23		
70.0	30	95.0	15	121.0	15		
71.0	44	96.0	48	122.0	3		
72.0	36	97.0	50	123.0	2		
73.0	29	98.0	45	124.0	10		

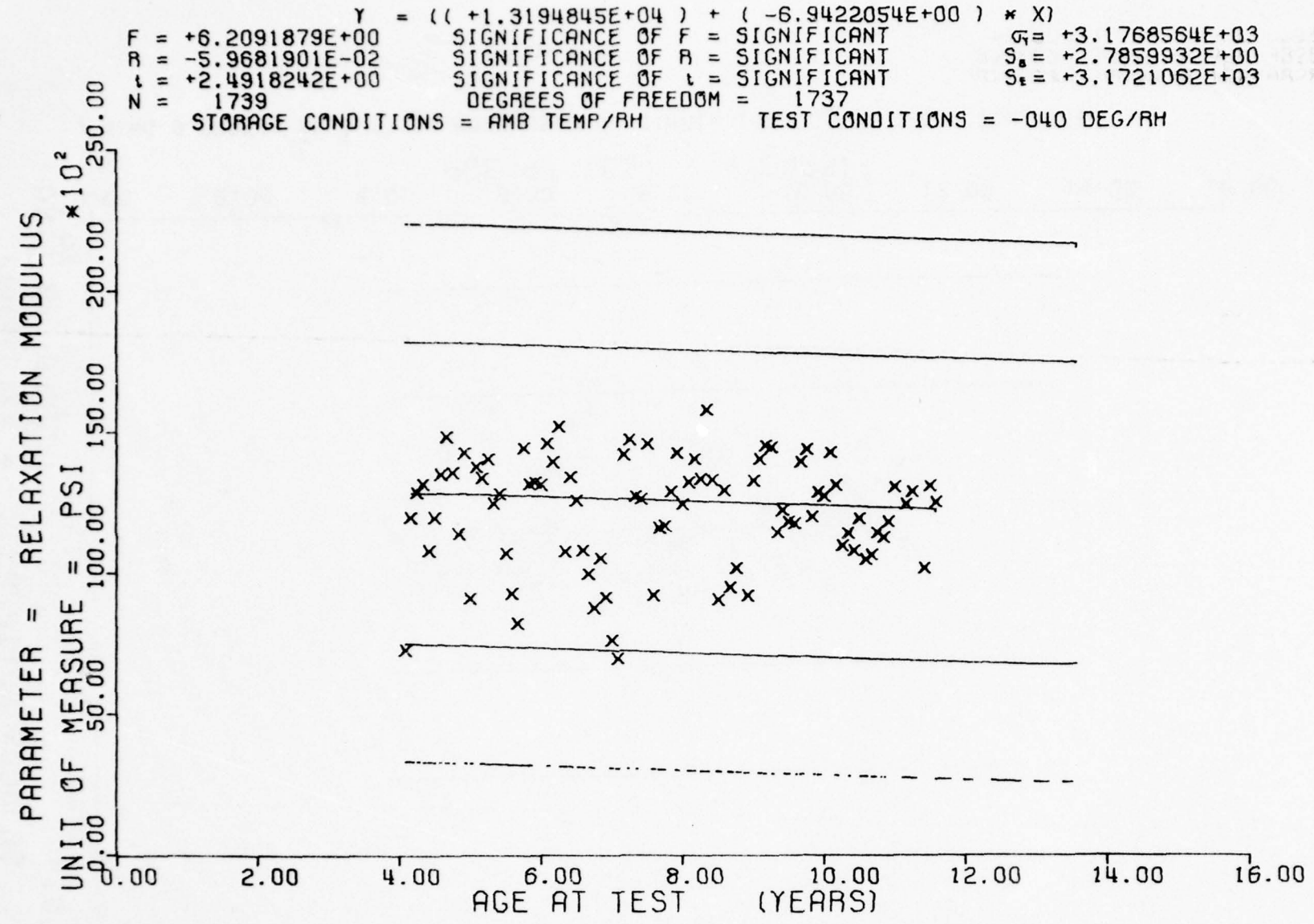
WING 6,STRESS RELAXATION MODULUS,0.5% STRAIN,10 SEC,-40 DEG F,TPH-1011

This sample size summary is applicable to figures 30 thru 33.



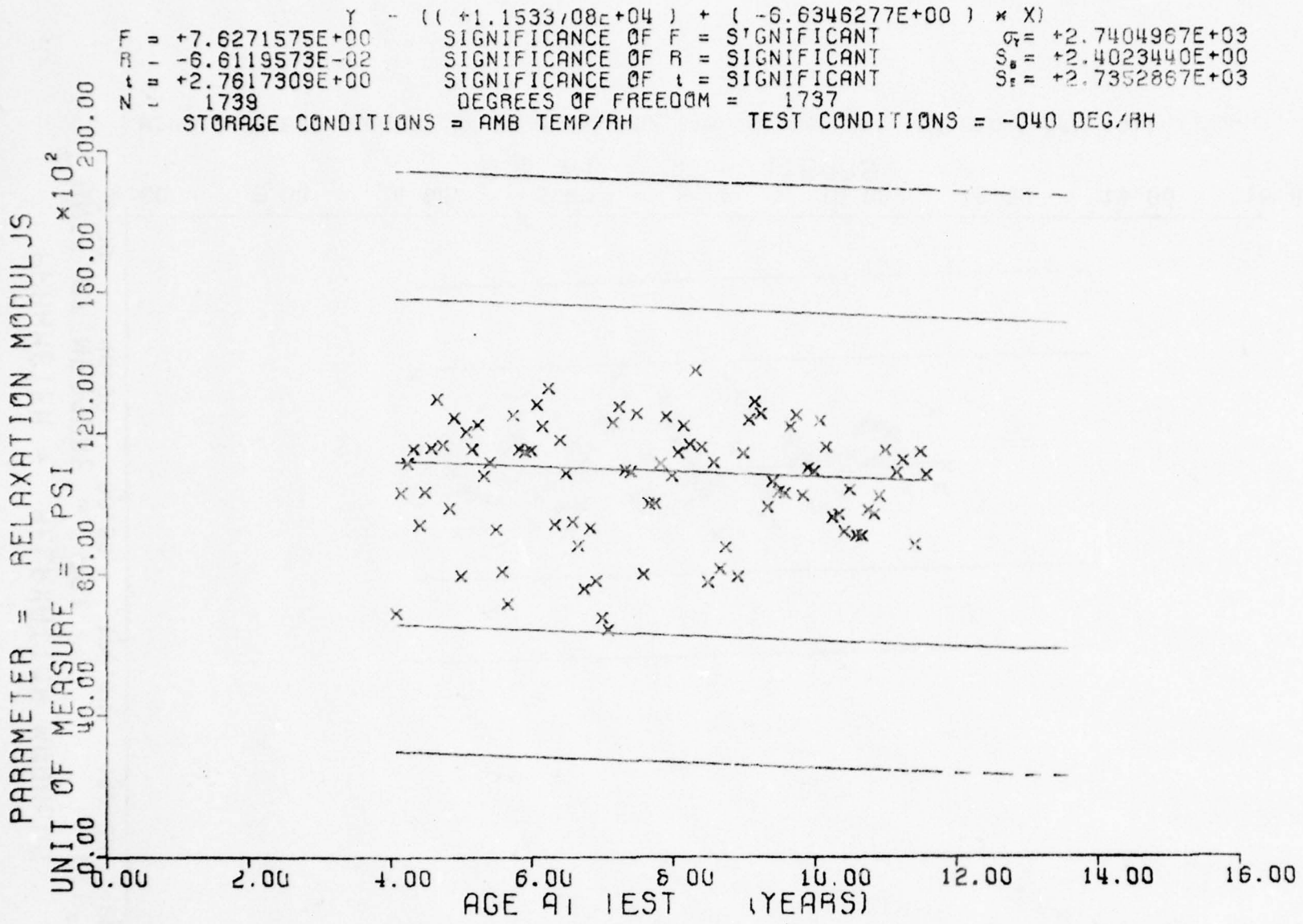
WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 10 SEC, -40 DEG F, TPH-1011

Figure 30



WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 50 SEC, -40 DEG F, TPH-1011

Figure 31



WING 6, STRESS RELAXATION MODULUS, 0.5% STRAIN, 100 SEC, -40 DEG F, TPH-1011

Figure 32

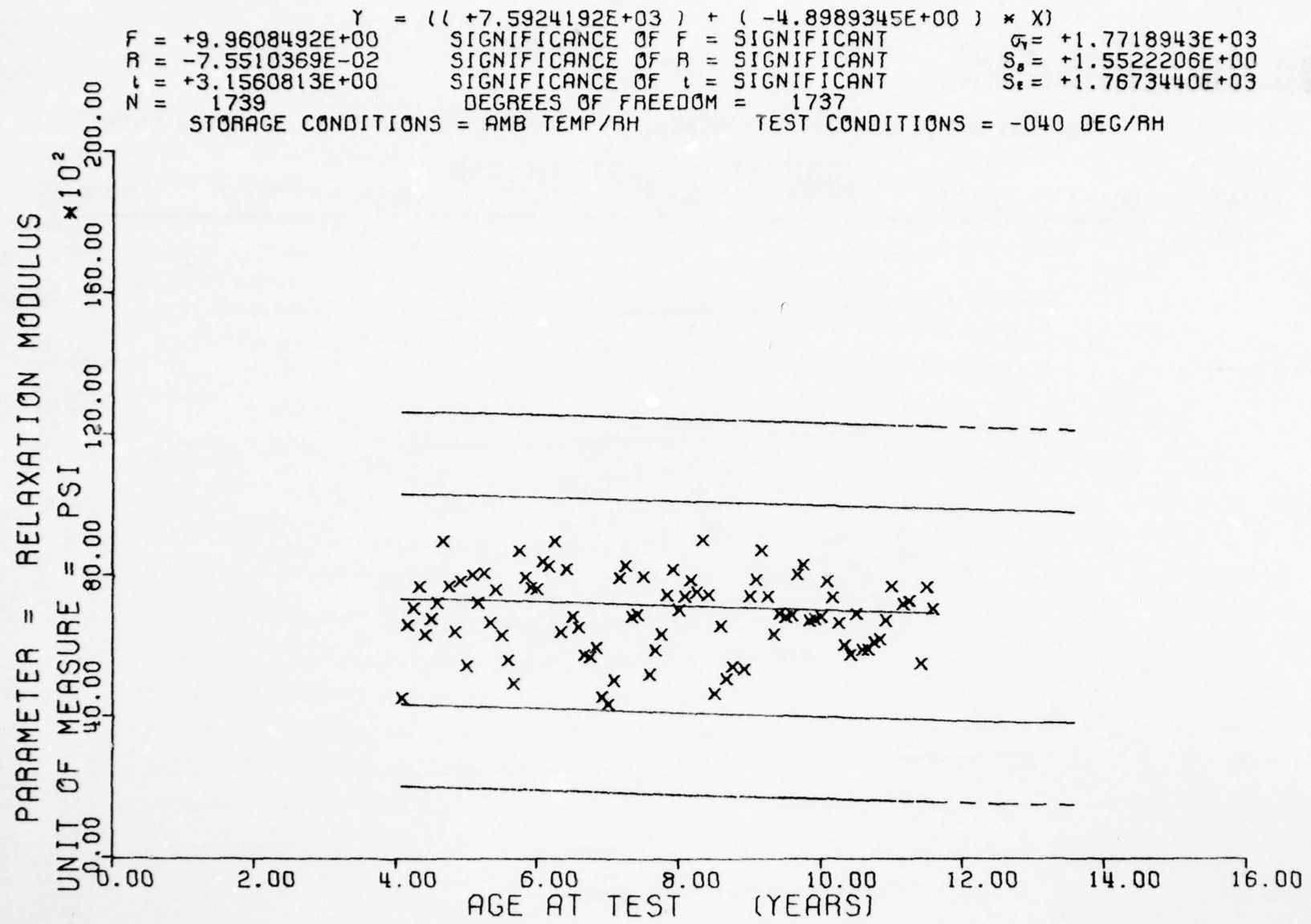

Y = ((+7.5924192E+03) + (-4.8989345E+00) * X)
F = +9.9608492E+00 SIGNIFICANCE OF F = SIGNIFICANT σY = +1.7718943E+03
R = -7.5510369E-02 SIGNIFICANCE OF R = SIGNIFICANT Sb = +1.5522206E+00
t = +3.1560813E+00 SIGNIFICANCE OF t = SIGNIFICANT Se = +1.7673440E+03
N = 1739 DEGREES OF FREEDOM = 1737
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = -040 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10²
0.00
40.00
80.00
120.00
160.00
200.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,0.5% STRAIN,1000 SEC,-40 DEG F,TPH-1011

Figure 33

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
49.0	6	74.0	33	99.0	33	125.0	15
50.0	27	75.0	29	100.0	18	126.0	17
51.0	59	76.0	23	101.0	18	127.0	11
52.0	48	77.0	28	102.0	5	128.0	18
53.0	15	78.0	33	103.0	9	129.0	3
54.0	32	79.0	15	104.0	3	130.0	24
55.0	15	80.0	21	105.0	6	131.0	42
56.0	18	81.0	15	107.0	9	132.0	9
57.0	30	82.0	18	108.0	9	134.0	27
58.0	16	83.0	12	109.0	6	135.0	6
59.0	6	84.0	9	110.0	6	137.0	9
60.0	22	85.0	3	111.0	3	138.0	20
61.0	21	86.0	15	112.0	24	139.0	60
62.0	49	87.0	14	113.0	47		
63.0	24	88.0	21	114.0	35		
64.0	27	89.0	15	115.0	33		
65.0	12	90.0	15	116.0	39		
66.0	9	91.0	12	117.0	21		
67.0	7	92.0	15	118.0	15		
68.0	5	93.0	15	119.0	27		
69.0	29	94.0	15	120.0	21		
70.0	24	95.0	23	121.0	15		
71.0	46	96.0	48	122.0	3		
72.0	42	97.0	42	123.0	6		
73.0	21	98.0	45	124.0	17		

WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC, 20 DEG F,TPH-1011

This sample size summary is applicable to figures 34 thru 37.

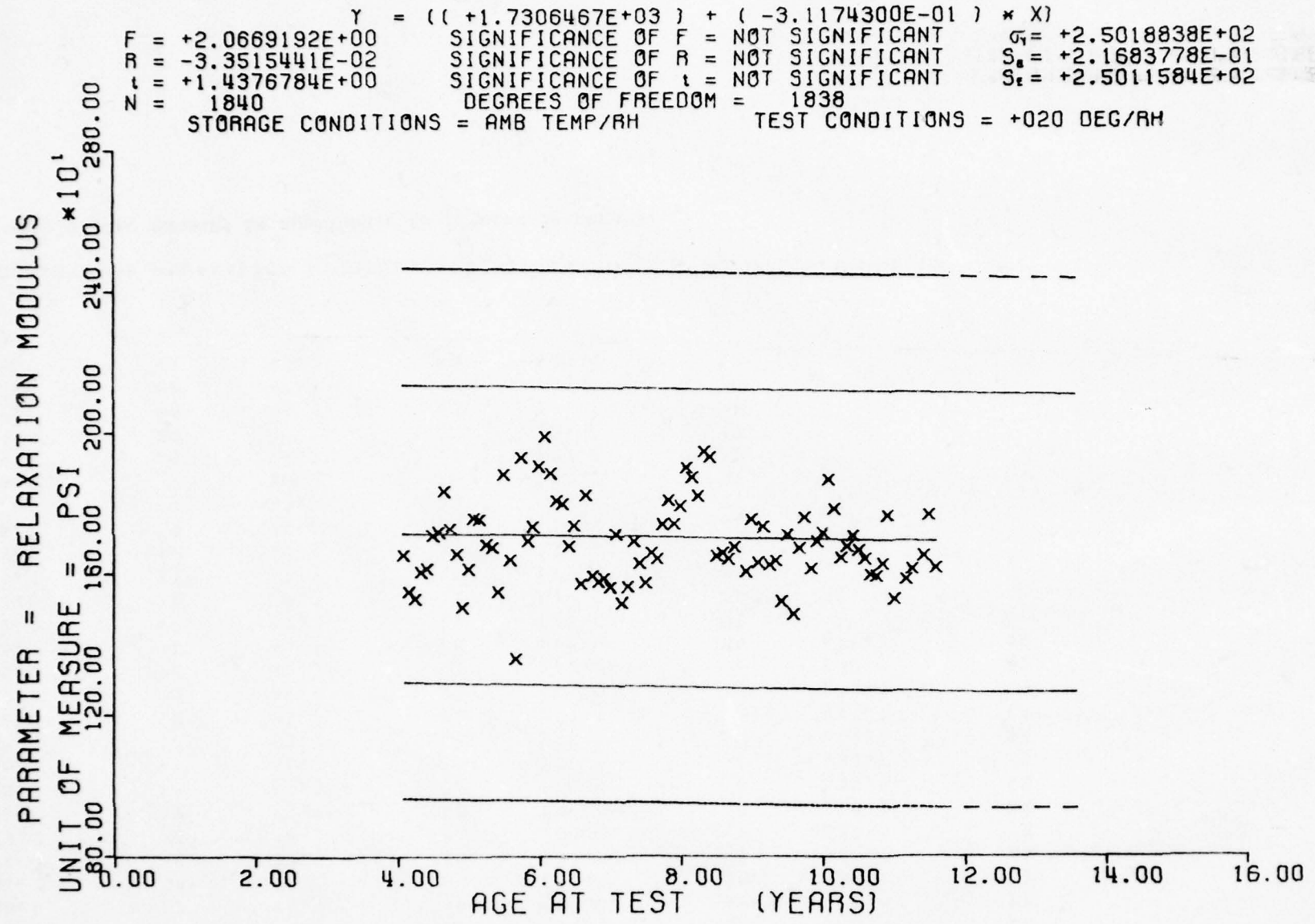
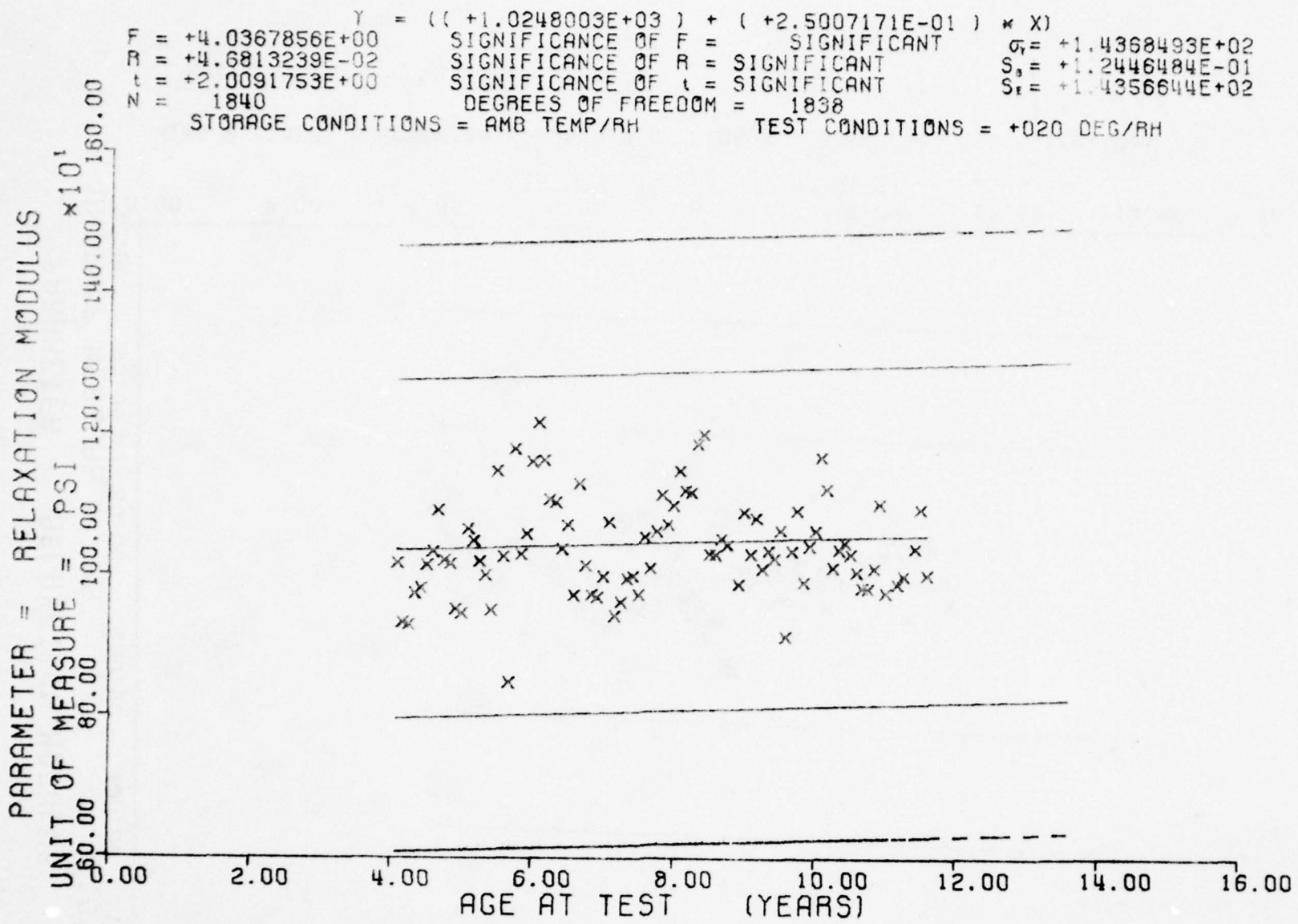

Y = ((+1.7306467E+03) + (-3.1174300E-01) * X)
F = +2.0669192E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT σ1 = +2.5018838E+02
R = -3.3515441E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT Se = +2.1683778E-01
t = +1.4376784E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT St = +2.5011584E+02
N = 1840 DEGREES OF FREEDOM = 1838
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +020 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10¹
80.00
120.00
160.00
200.00
240.00
280.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC, 20 DEG F,TPH-1011

Figure 34



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 20 DEG F, TPH-1011

Figure 35

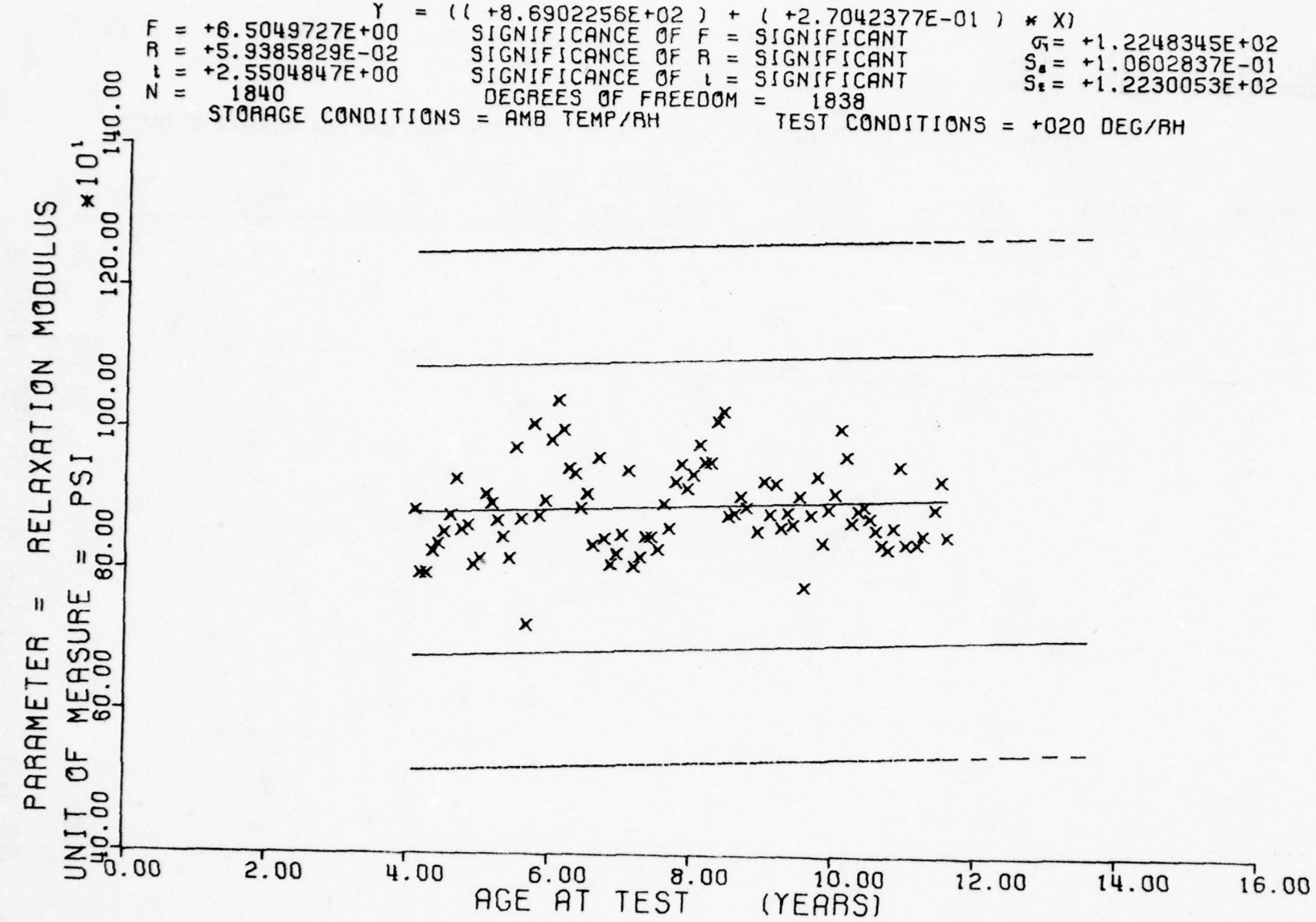
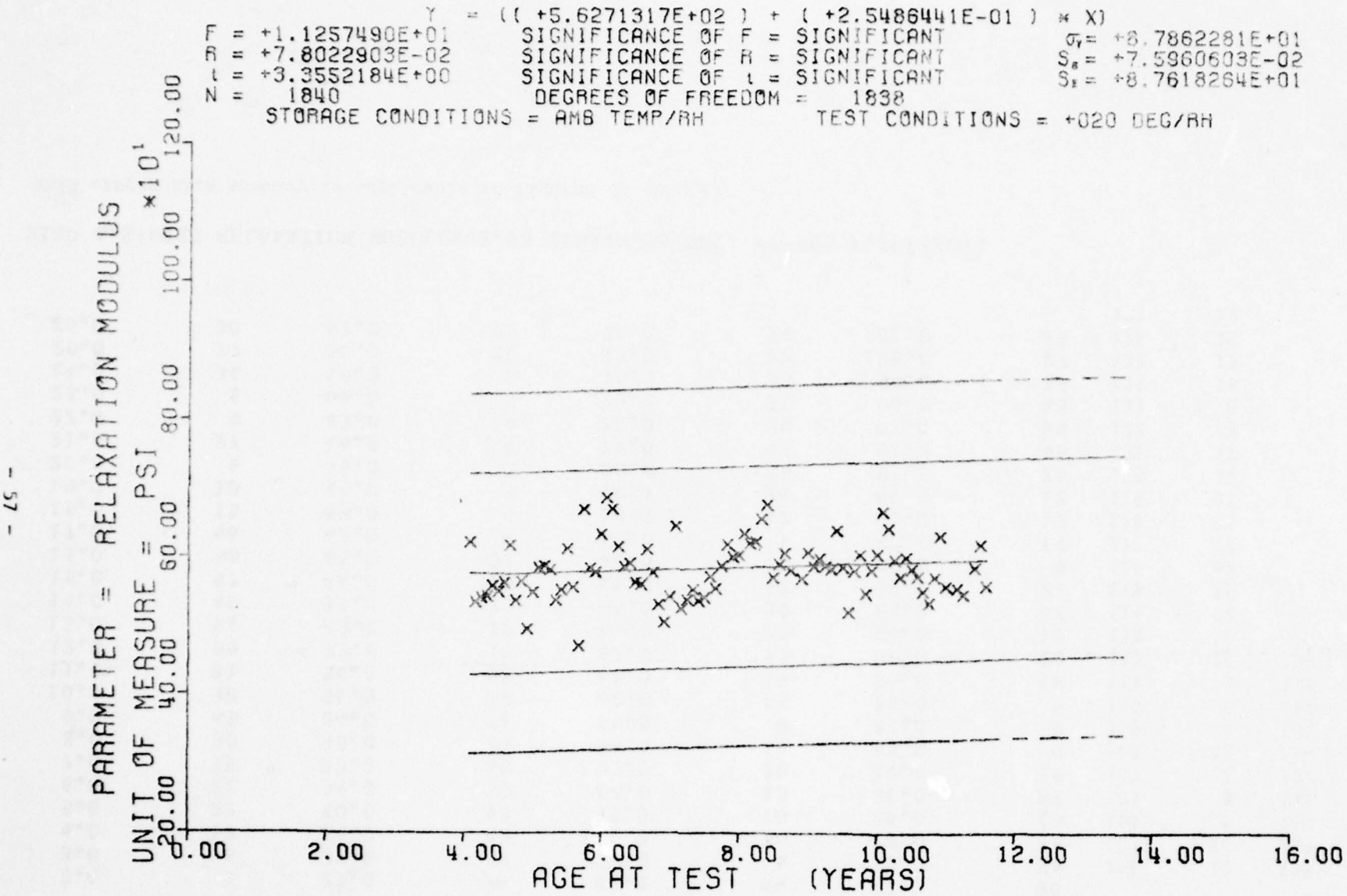

Y = ((+8.6902256E+02) + (+2.7042377E-01) * X)
F = +6.5049727E+00 SIGNIFICANCE OF F = SIGNIFICANT
R = +5.9385829E-02 SIGNIFICANCE OF R = SIGNIFICANT
ι = +2.5504847E+00 SIGNIFICANCE OF ι = SIGNIFICANT
N = 1840 DEGREES OF FREEDOM = 1838
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +020 DEG/RH
σ = +1.2248345E+02
S_a = +1.0602837E-01
S_ε = +1.2230053E+02
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10^1
140.00
120.00
100.00
80.00
60.00
40.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,100 SEC, 20 DEG F,TPH-1011

Figure 36



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 1000 SEC, 20 DEG F, TPH-1011

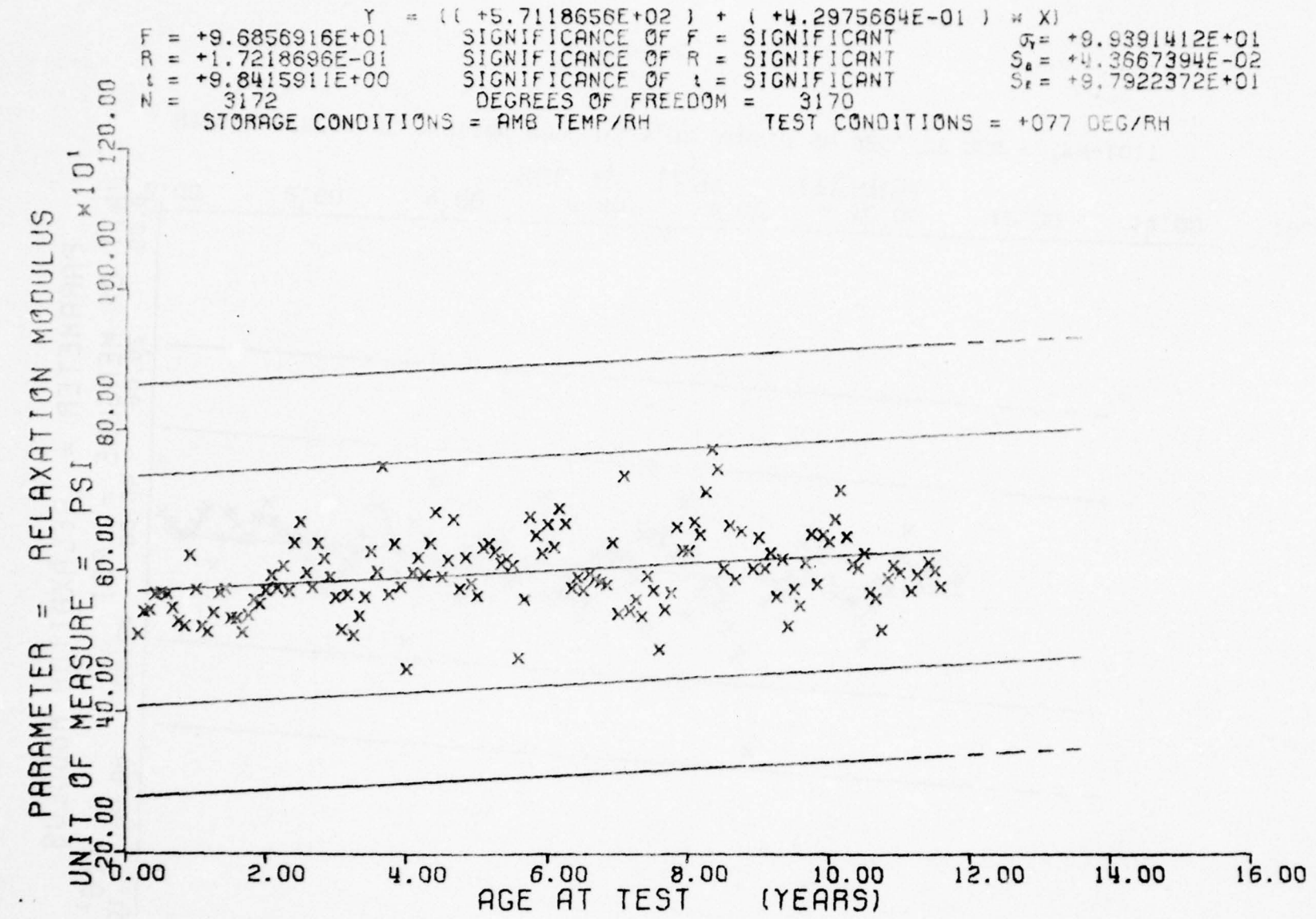
Figure 37

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES	AGE MONTHS	NR SAMPLES
2.0	3	27.0	24	52.0	54	77.0	30				
3.0	6	28.0	27	53.0	6	78.0	36	102	12	128	18
4.0	18	29.0	48	54.0	36	79.0	18	103	14	129	3
5.0	22	30.0	43	55.0	16	80.0	15	104	6	130	33
6.0	21	31.0	30	56.0	18	81.0	27	105	3	131	36
7.0	35	32.0	60	57.0	30	82.0	15	107	7	132	8
8.0	30	33.0	29	58.0	15	83.0	9	108	12	134	27
9.0	45	34.0	51	59.0	9	84.0	9	109	6	135	6
10.0	38	35.0	30	60.0	23	85.0	3	110	6	137	9
11.0	37	36.0	52	61.0	15	86.0	18	111	3	138	39
12.0	65	37.0	15	62.0	56	87.0	21	112	21	139	42
13.0	51	38.0	18	63.0	21	88.0	18	113	56		
14.0	46	39.0	21	64.0	30	89.0	18	114	38		
15.0	57	40.0	18	65.0	12	90.0	21	115	15		
16.0	36	41.0	21	66.0	9	91.0	9	116	62		
17.0	46	42.0	9	67.0	3	92.0	17	117	18		
18.0	13	43.0	9	68.0	12	93.0	12	118	15		
19.0	10	44.0	3	69.0	24	94.0	12	119	21		
20.0	4	45.0	6	70.0	33	95.0	24	120	27		
21.0	27	46.0	9	71.0	47	96.0	48	121	12		
22.0	9	47.0	9	72.0	39	97.0	54	122	3		
23.0	6	48.0	3	73.0	21	98.0	45	123	6		
24.0	34	49.0	6	74.0	33	99.0	36	124	18		
25.0	27	50.0	21	75.0	27	100.0	17	125	15		
26.0	30	51.0	76	76.0	24	101.0	25	126	19		
								127	12		

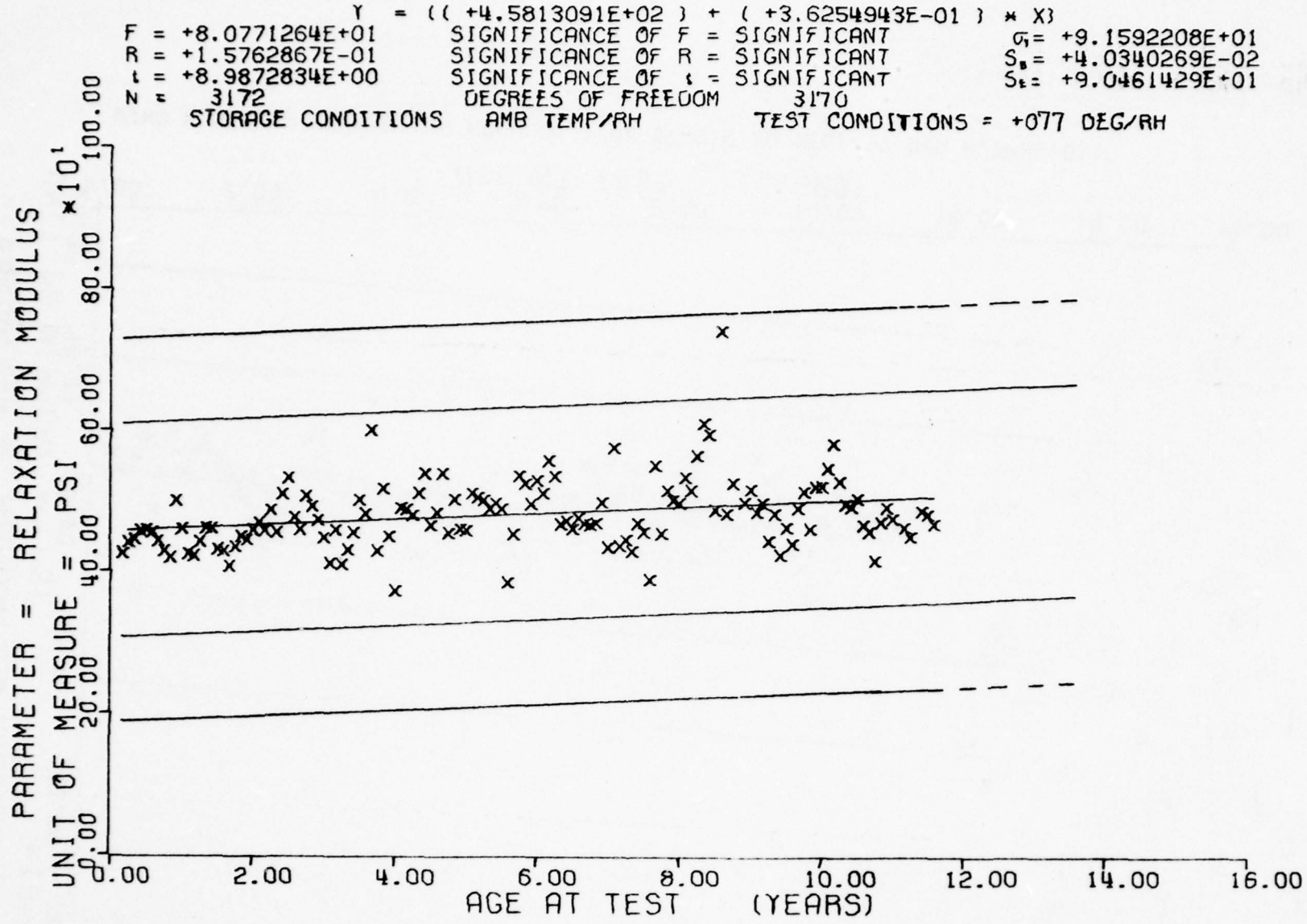
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,50 SEC, 77 DEG F,TPH-1011

This sample size summary is applicable to figures 38 thru 41.



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 77 DEG F, TPH-1011

Figure 38



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 77 DEG F, TPH-1011

Figure 39

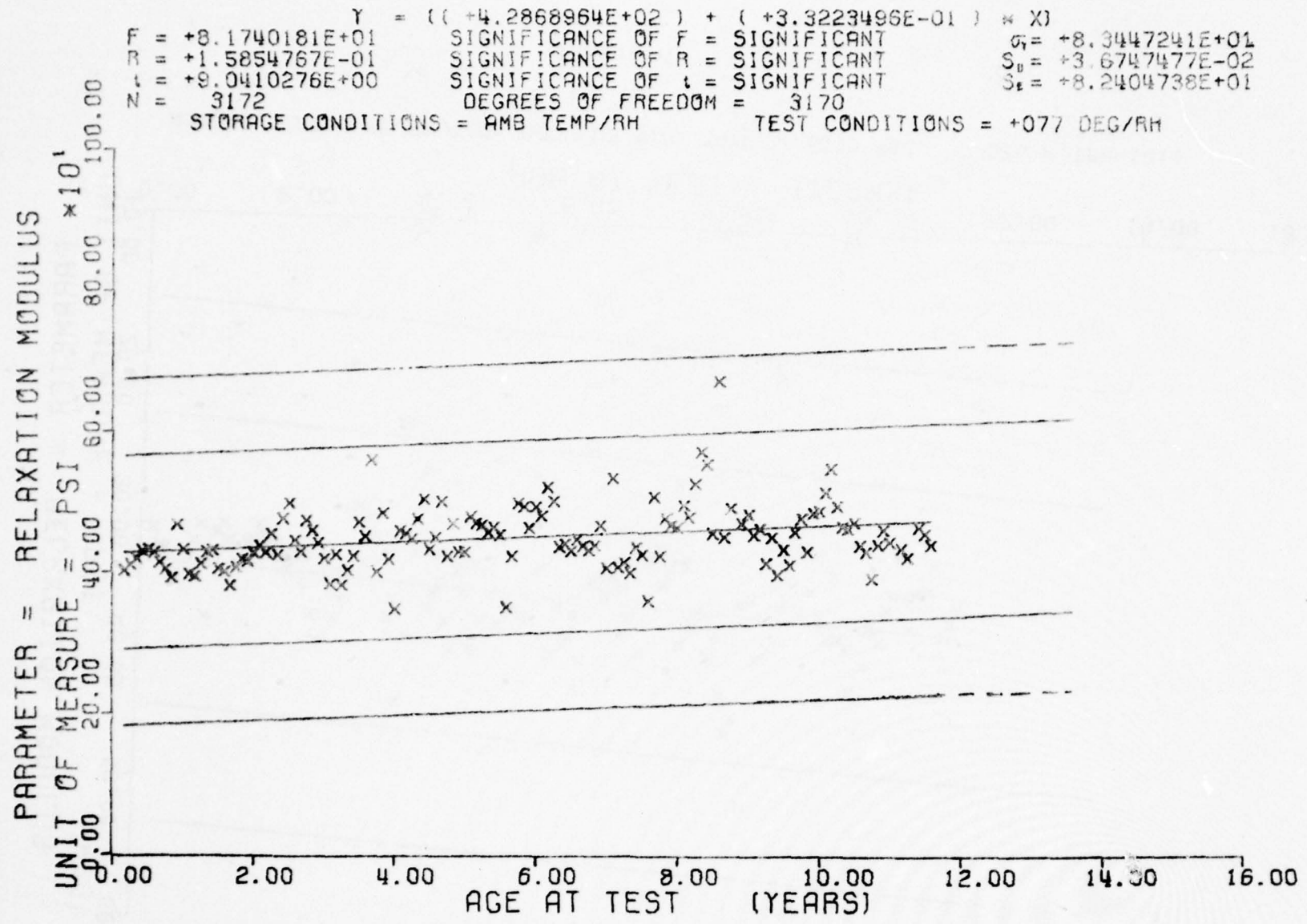
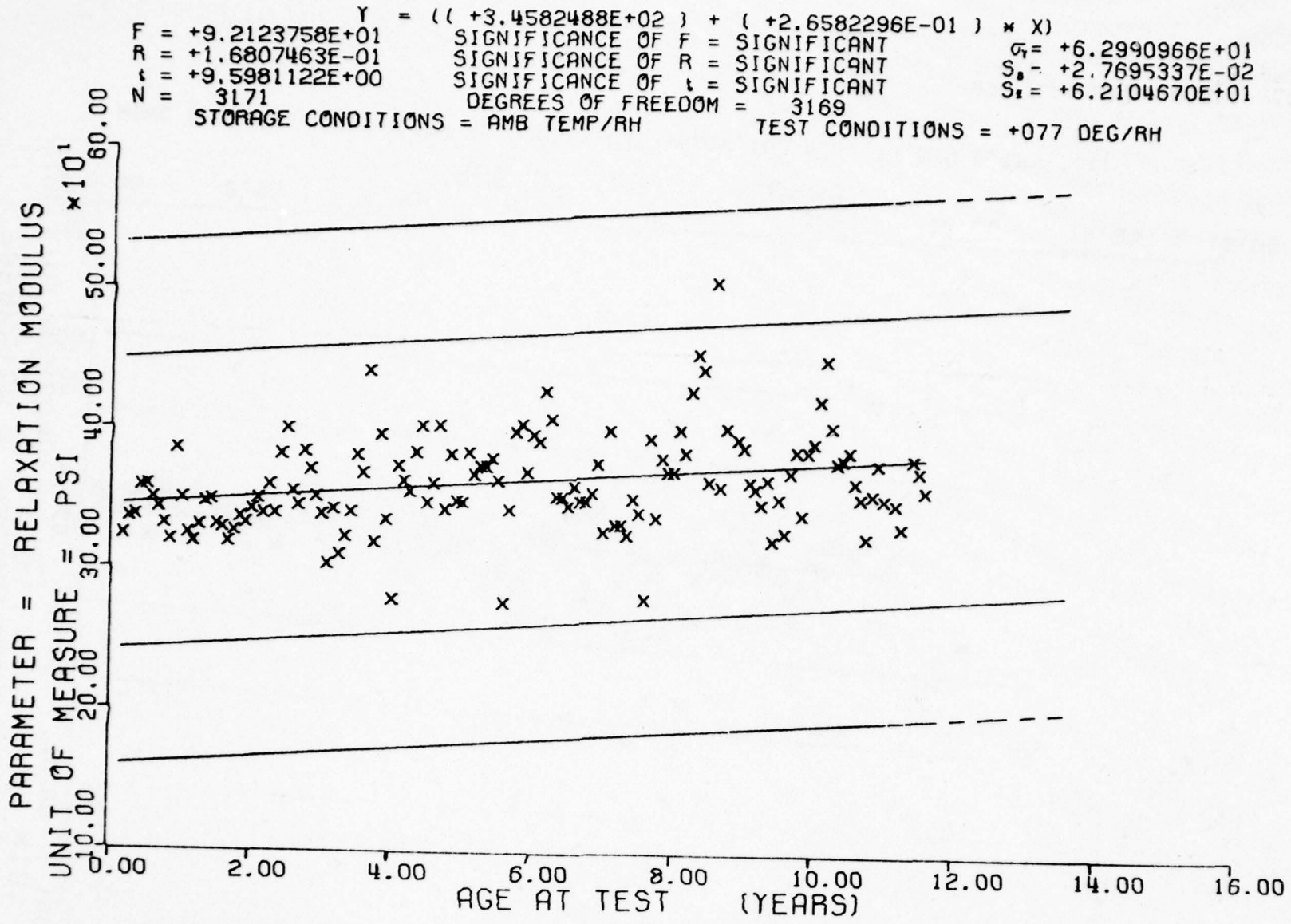

Y = ((+4.2868964E+02) + (+3.3223496E-01) * X)
F = +8.1740181E+01 SIGNIFICANCE OF F = SIGNIFICANT
R = +1.5854767E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +9.0410276E+00 SIGNIFICANCE OF t = SIGNIFICANT
N = 3172 DEGREES OF FREEDOM = 3170
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +077 DEG/RH
σ = +8.3447241E+01
S_b = +3.6747477E-02
S_t = +8.2404738E+01
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI *10^1
0.00
20.00
40.00
60.00
80.00
100.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,100 SEC, 77 DEG F,TPH-1011

Figure 40



WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,1000 SEC, 77 DEG F,TPH-1011

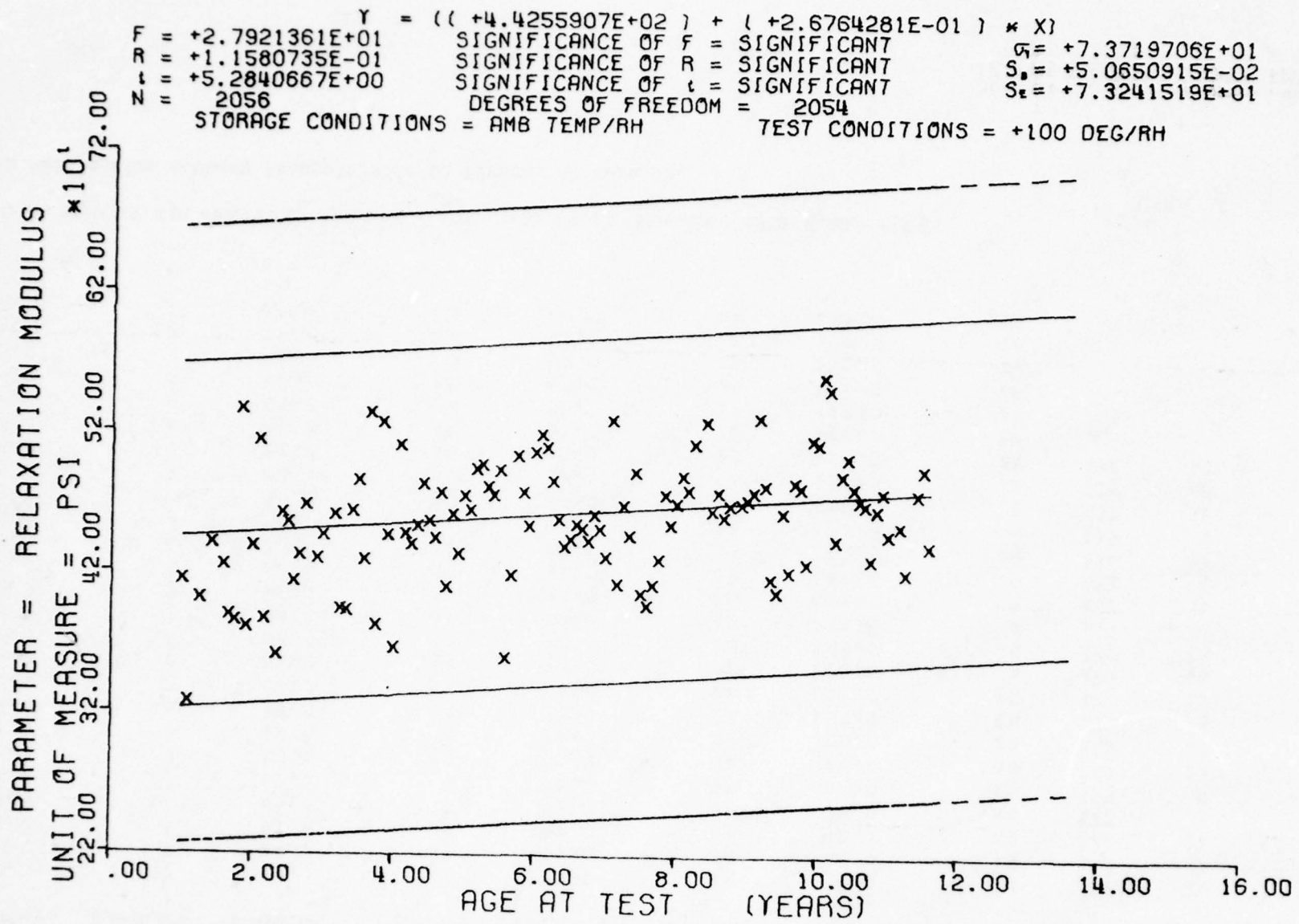
Figure 41

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
12.0	3	43.0	9	68.0	12	93.0	15	119	21
13.0	3	44.0	3	69.0	24	94.0	15	120	27
15.0	6	45.0	9	70.0	27	95.0	21	121	12
17.0	15	46.0	6	71.0	48	96.0	48	122	3
19.0	6	47.0	9	72.0	42	97.0	45	123	9
20.0	3	48.0	3	73.0	21	98.0	48	124	15
21.0	9	49.0	6	74.0	36	99.0	33	125	15
22.0	6	50.0	27	75.0	24	100.0	15	126	18
23.0	3	51.0	57	76.0	26	101.0	15	127	12
24.0	6	52.0	45	77.0	30	102.0	6	128	18
25.0	9	53.0	12	78.0	33	103.0	9	129	3
26.0	9	54.0	28	79.0	15	104.0	6	130	33
28.0	3	55.0	27	80.0	18	105.0	3	131	36
29.0	9	56.0	27	81.0	24	107.0	5	132	6
30.0	9	57.0	31	82.0	15	108.0	12	134	27
31.0	3	58.0	24	83.0	12	109.0	6	135	6
32.0	9	59.0	12	84.0	9	110.0	6	137	12
33.0	9	60.0	15	85.0	3	111.0	3	138	45
35.0	15	61.0	20	86.0	12	112.0	24	139	45
36.0	24	62.0	48	87.0	6	113.0	45		
38.0	6	63.0	21	88.0	11	114.0	39		
39.0	9	64.0	33	89.0	6	115.0	15		
40.0	9	65.0	9	90.0	15	116.0	30		
41.0	12	66.0	12	91.0	12	117.0	18		
42.0	6	67.0	3	92.0	18	118.0	15		

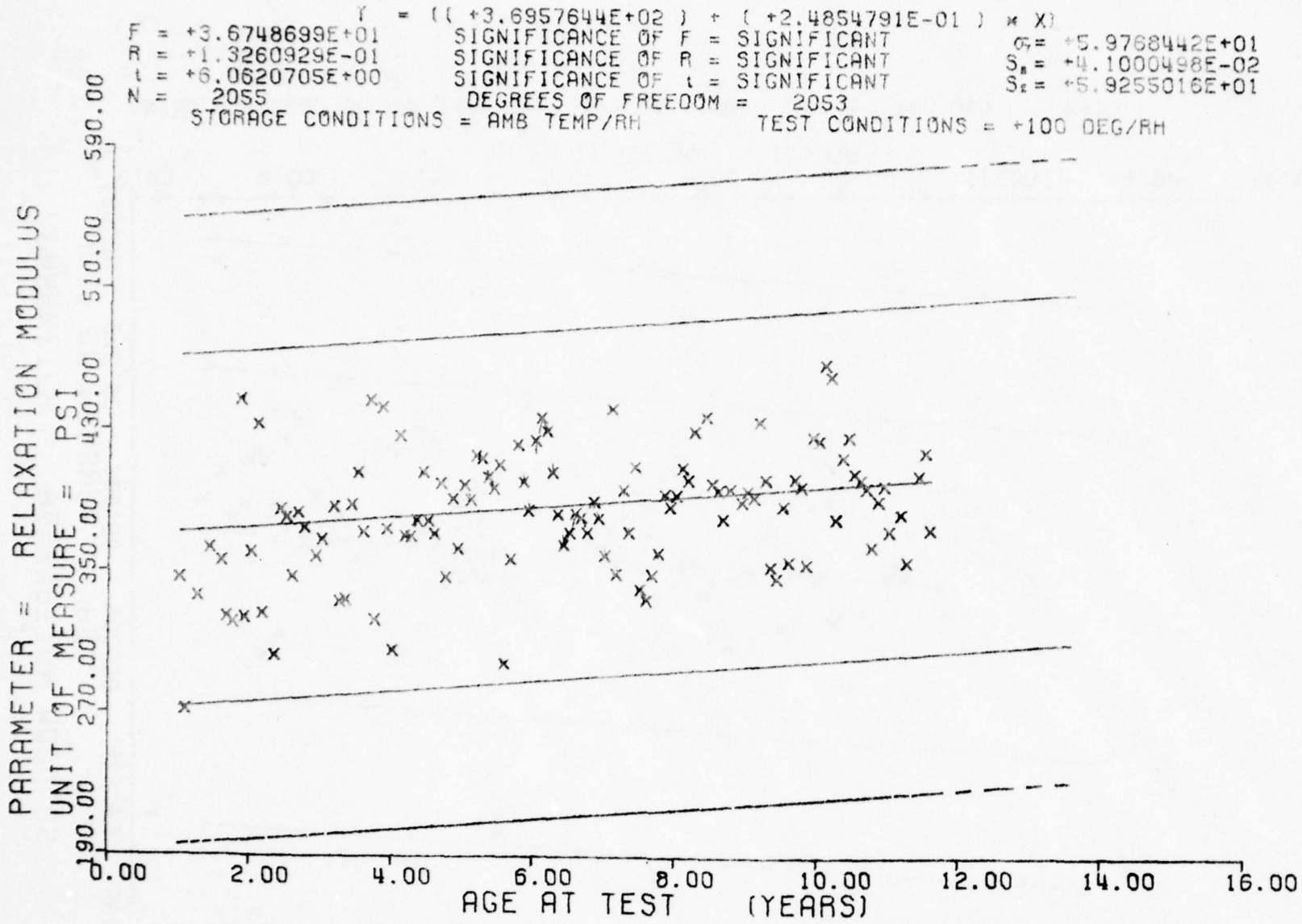
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC,100 DEC F,TPH-1011

This sample size summary is applicable to figures 42 thru 45.



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 100 DEG F, TPH-1011

Figure 42



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 100 DEG F, TPH-1011

Figure 43

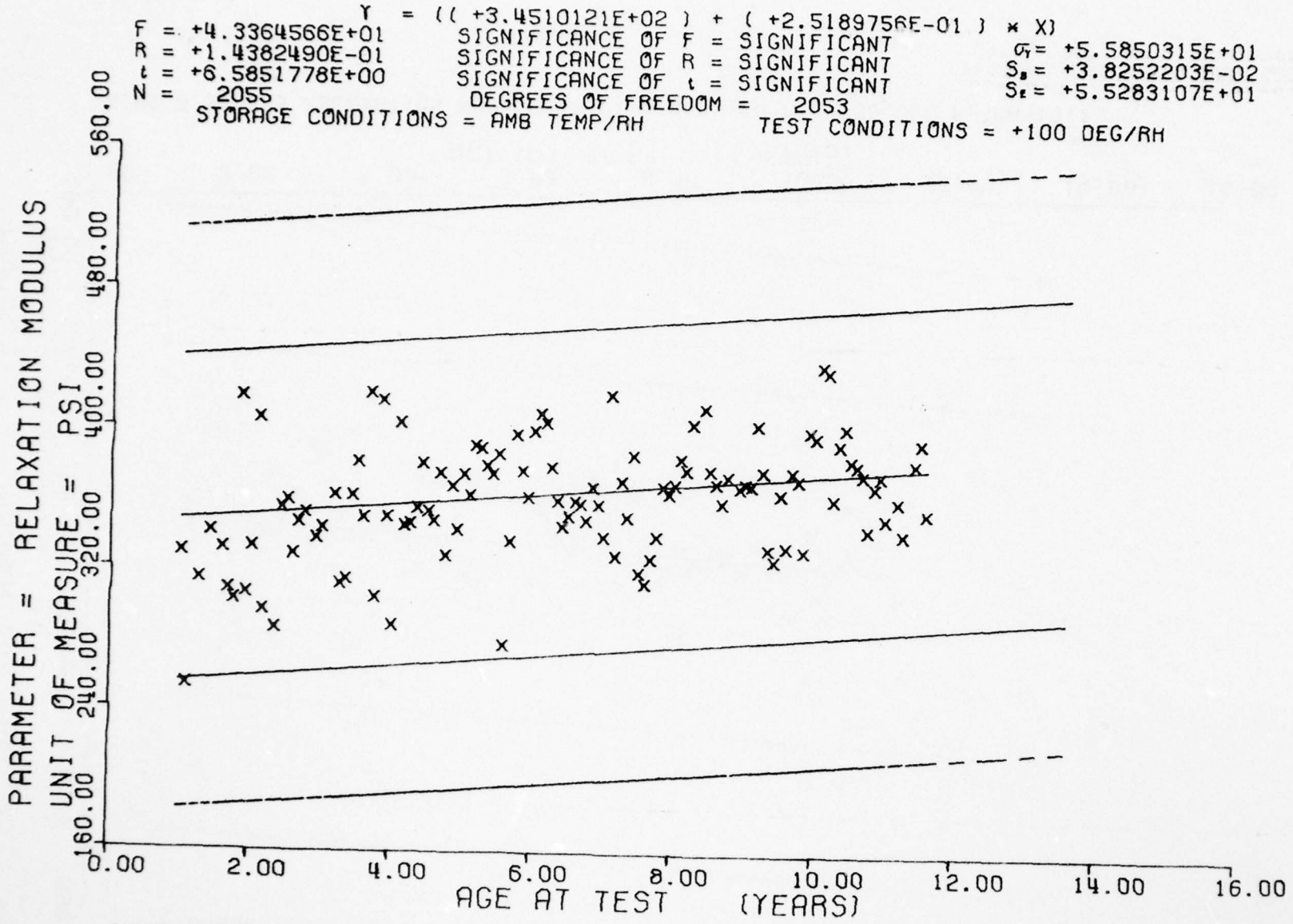

Y = ((+3.4510121E+02) + (+2.5189756E-01) * X)
F = +4.3364566E+01
SIGNIFICANCE OF F = SIGNIFICANT
σY = +5.5850315E+01
R = +1.4382490E-01
SIGNIFICANCE OF R = SIGNIFICANT
Sb = +3.8252203E-02
t = +6.5851778E+00
SIGNIFICANCE OF t = SIGNIFICANT
Se = +5.5283107E+01
N = 2055
DEGREES OF FREEDOM = 2053
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = +100 DEG/RH
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI
560.00
480.00
400.00
320.00
240.00
160.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,100 SEC,100 DEG F,TPH-1011

Figure 44

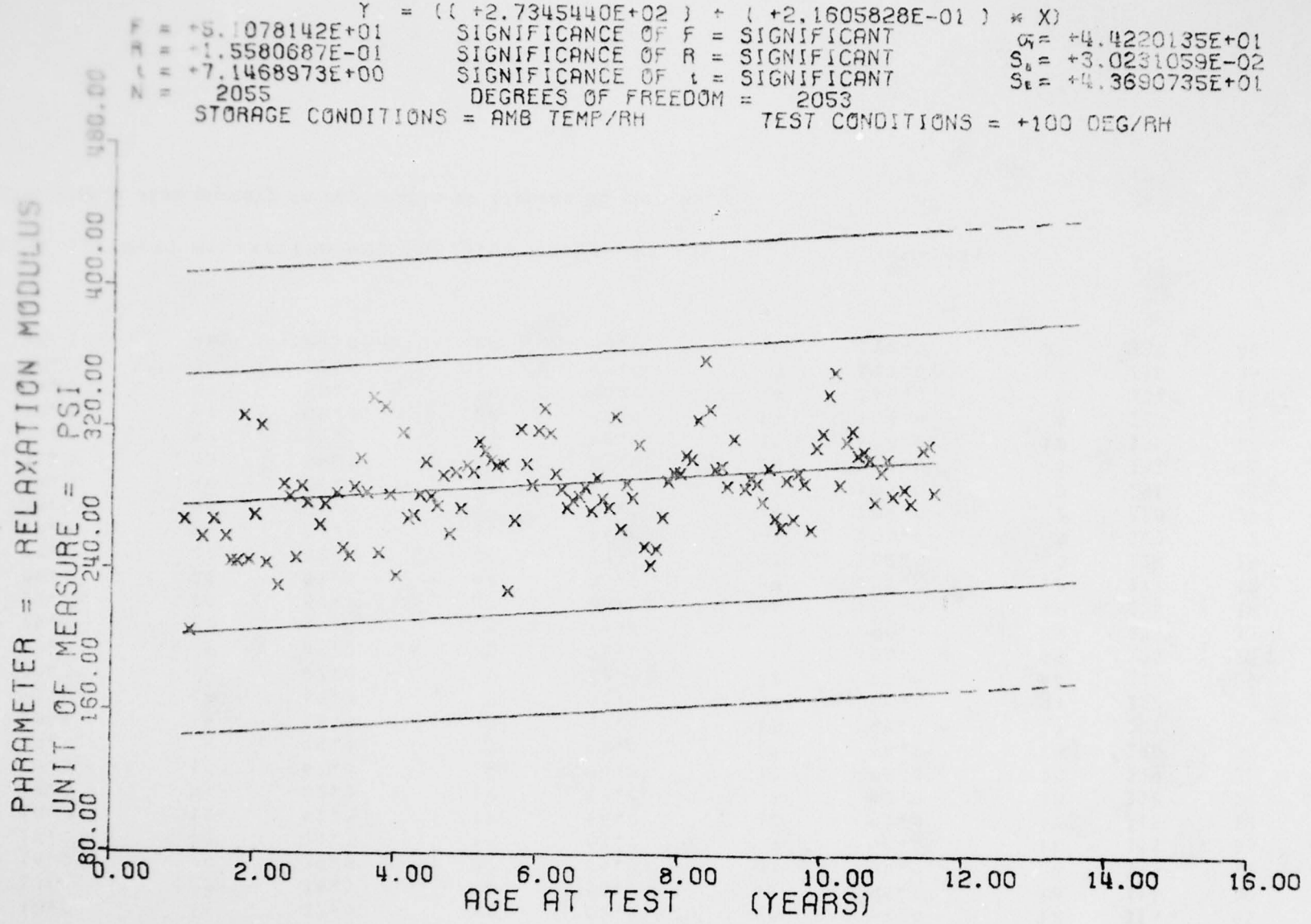

Y = ((+2.7345440E+02) + (+2.1605828E-01) * X)
F = +5.1078142E+01 SIGNIFICANCE OF F = SIGNIFICANT
R = -1.5580687E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +7.1468973E+00 SIGNIFICANCE OF t = SIGNIFICANT
N = 2055 DEGREES OF FREEDOM = 2053
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = +100 DEG/RH
σ = +4.4220135E+01
S_b = +3.0231059E-02
S_E = +4.3690735E+01
PARAMETER = RELAXATION MODULUS
UNIT OF MEASURE = PSI
80.00
160.00
240.00
320.00
400.00
480.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,1000 SEC,100 DEG F,TPH-1011

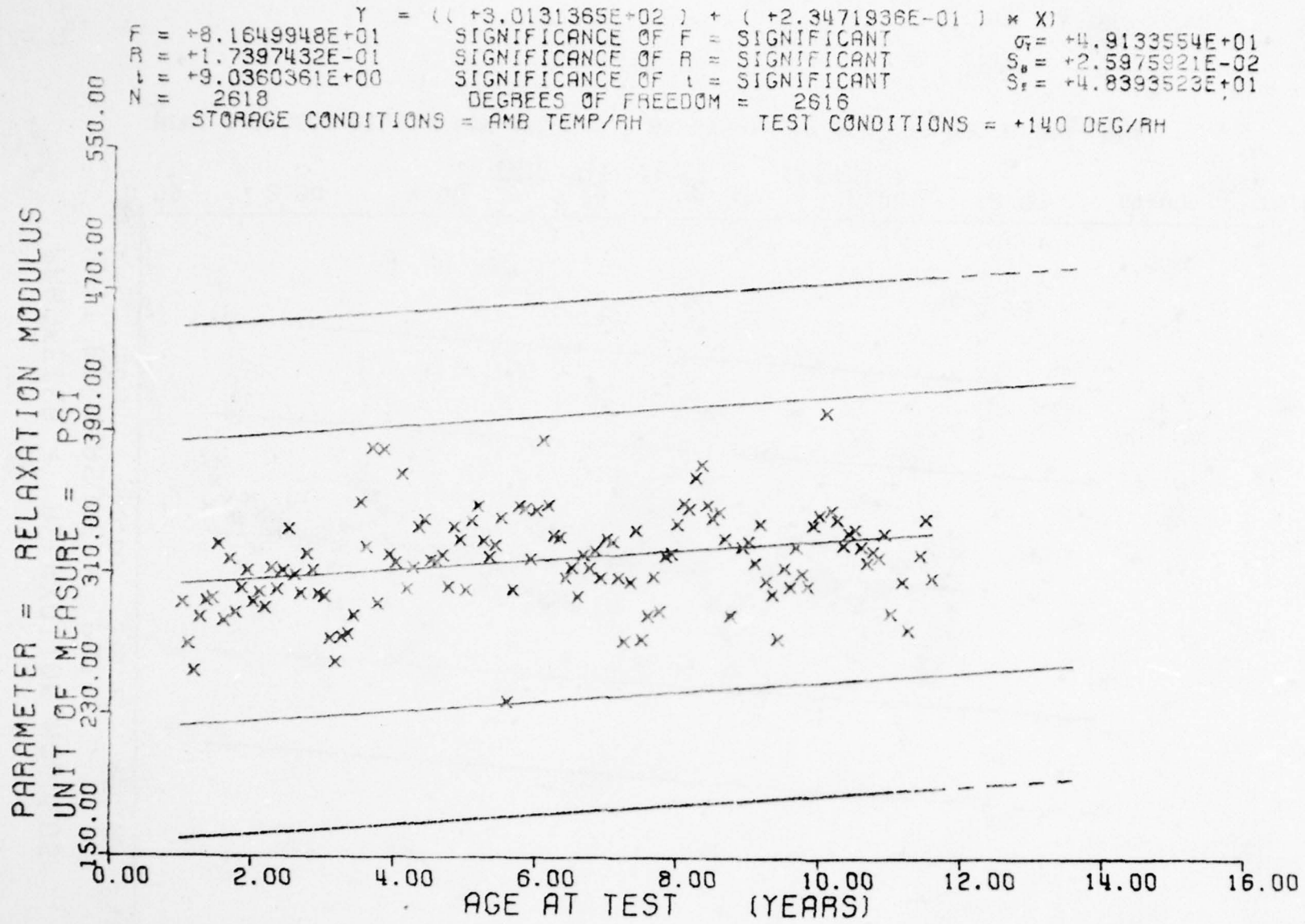
Figure 45

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
12.0	12	37.0	18	62.0	48	87.0	12	113	45
13.0	27	38.0	12	63.0	21	88.0	12	114	39
14.0	9	39.0	27	64.0	33	89.0	6	115	12
15.0	27	40.0	18	65.0	9	90.0	12	116	33
16.0	15	41.0	18	66.0	12	91.0	15	117	18
17.0	39	42.0	12	67.0	3	92.0	15	118	21
18.0	10	43.0	9	68.0	12	93.0	15	119	21
19.0	6	44.0	3	69.0	27	94.0	18	120	24
20.0	6	45.0	3	70.0	15	95.0	17	121	15
21.0	18	46.0	6	71.0	54	96.0	51	122	3
22.0	6	47.0	9	72.0	42	97.0	44	123	9
23.0	9	48.0	6	73.0	21	98.0	45	124	15
24.0	33	49.0	6	74.0	32	99.0	33	125	15
25.0	30	50.0	27	75.0	24	100.0	18	126	18
26.0	30	51.0	60	76.0	30	101.0	12	127	12
27.0	21	52.0	54	77.0	30	102.0	5	128	15
28.0	27	53.0	12	78.0	33	103.0	9	129	2
29.0	48	54.0	27	79.0	14	104.0	3	130	27
30.0	45	55.0	27	80.0	17	105.0	3	131	42
31.0	33	56.0	24	81.0	18	107.0	6	132	6
32.0	57	57.0	33	82.0	15	108.0	12	134	27
33.0	27	58.0	24	83.0	12	109.0	6	135	6
34.0	57	59.0	9	84.0	9	110.0	9	137	12
35.0	30	60.0	17	85.0	3	111.0	3	138	36
36.0	45	61.0	24	86.0	9	112.0	21	139	48

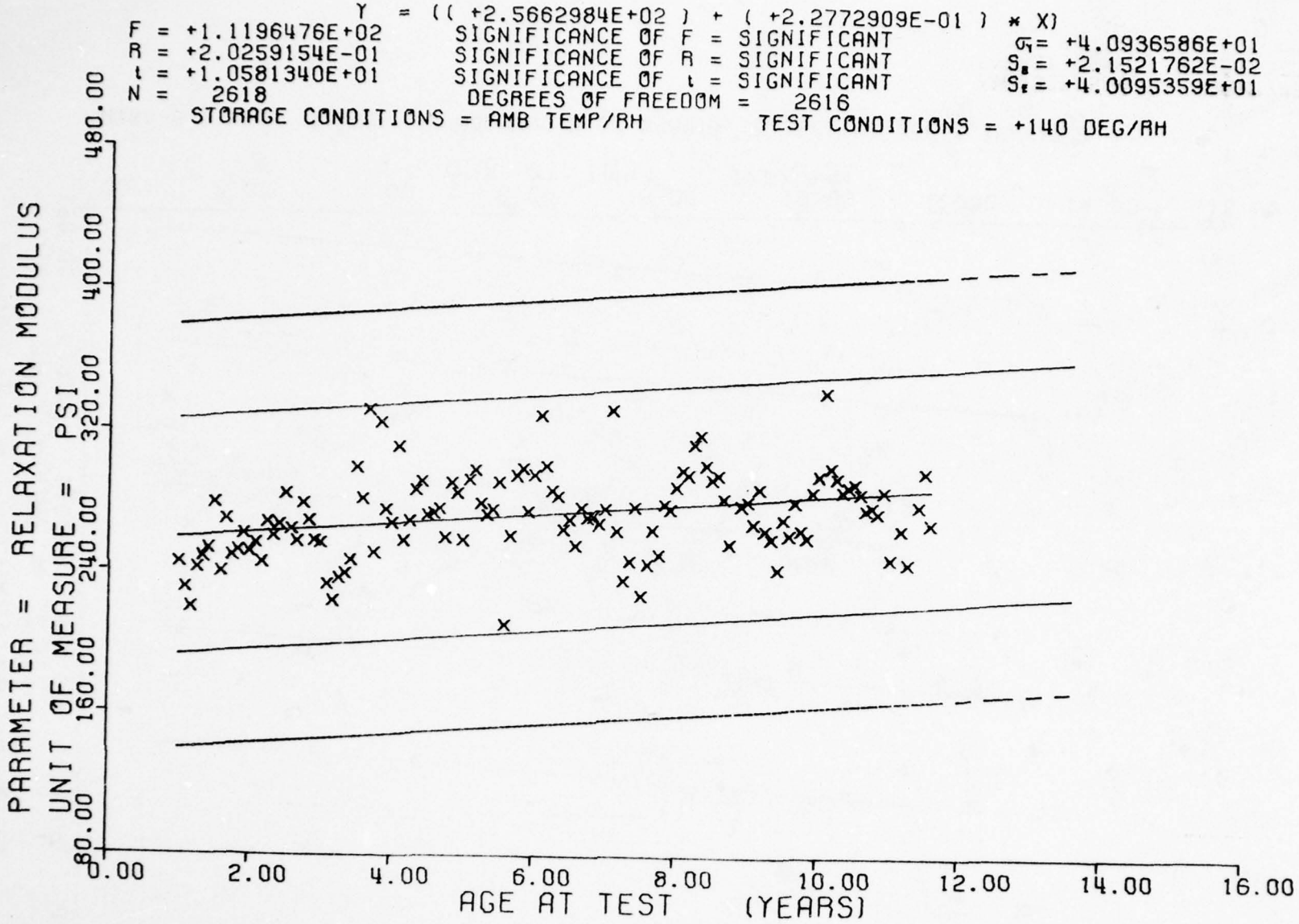
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC,140 DEG F,TPH-1011

This sample size summary is applicable to figures 46 thru 49.



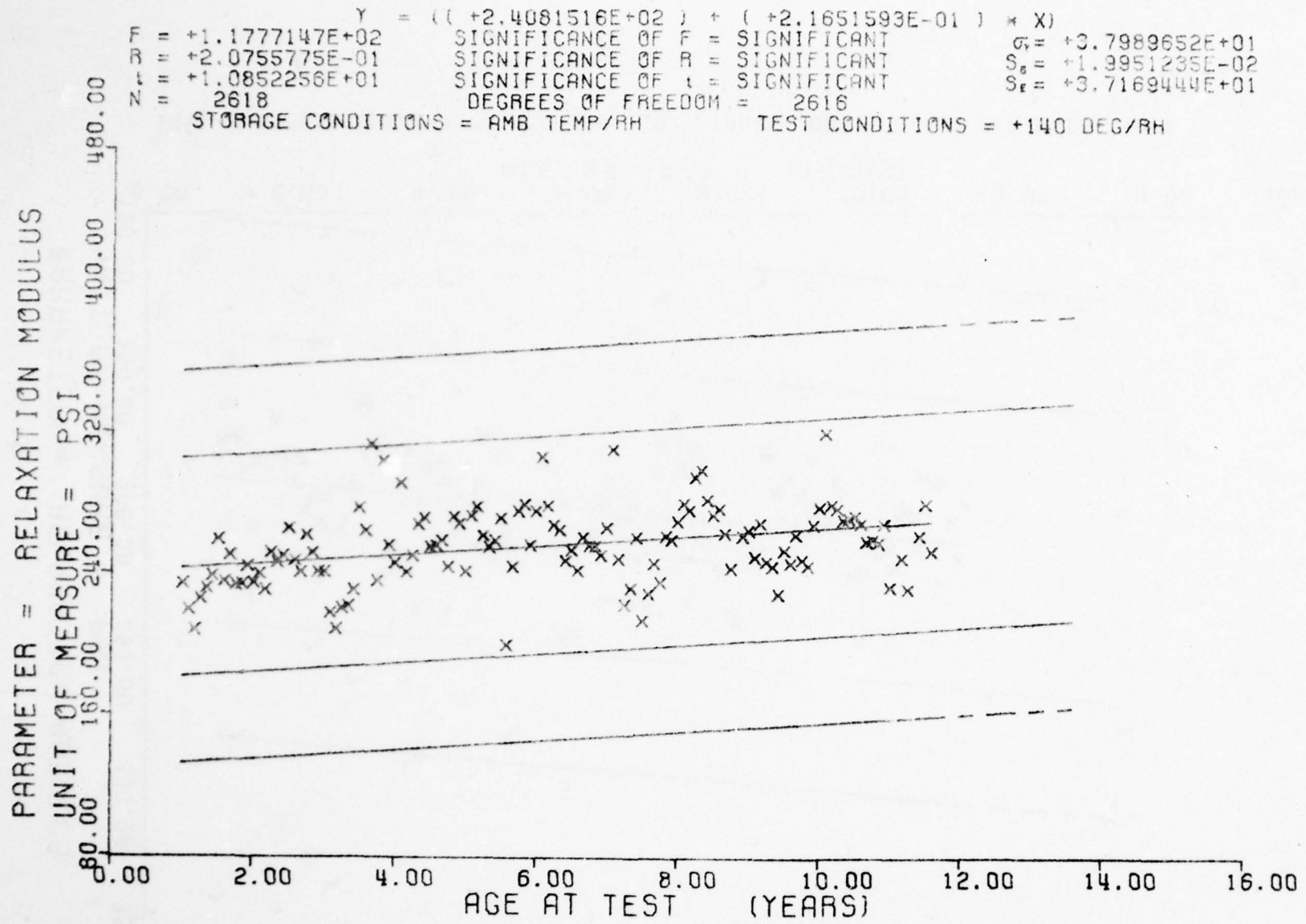
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC,140 DEG F,TPH-1011

Figure 46



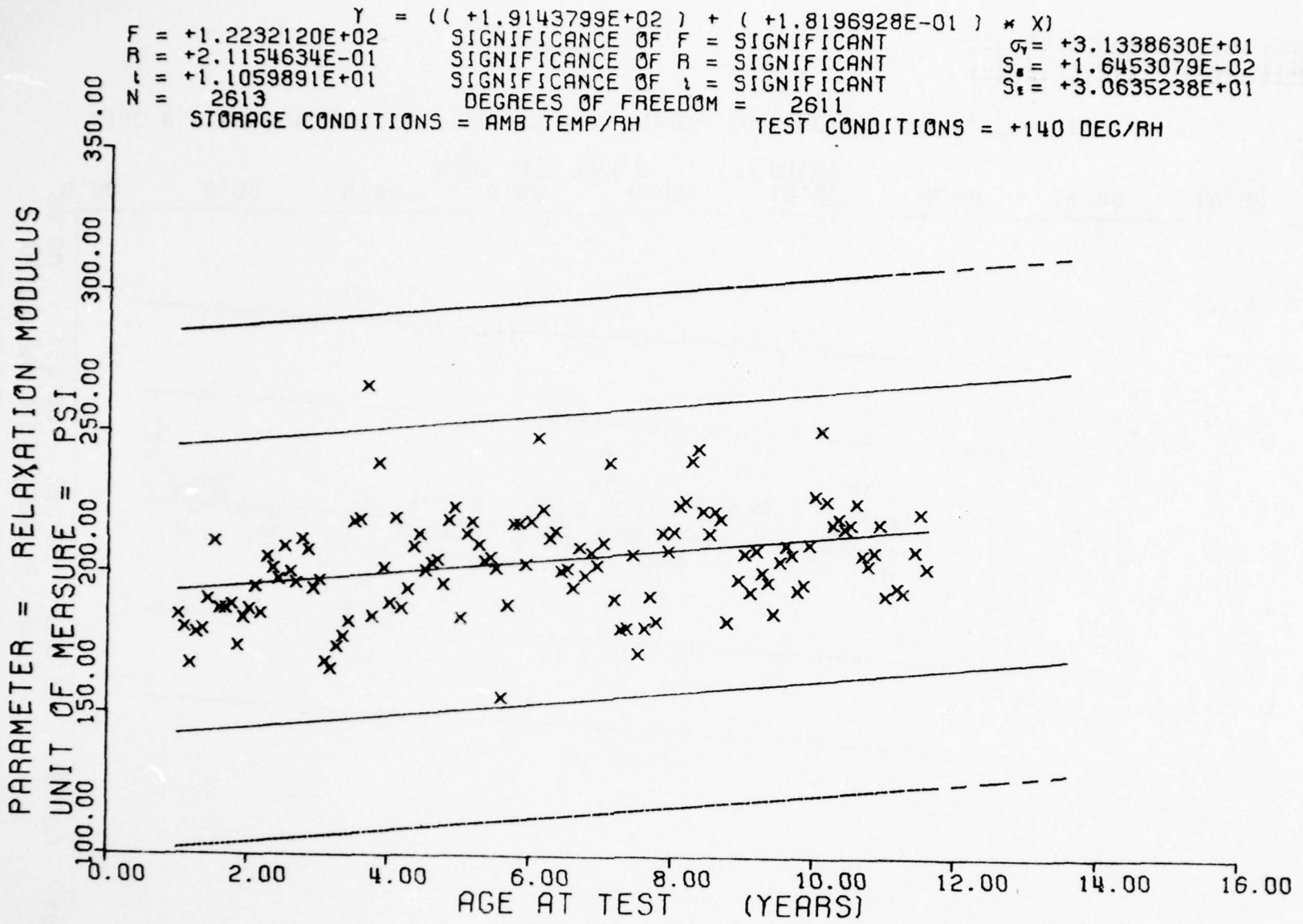
WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 140 DEG F, TPH-1011

Figure 47



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 140 DEG F, TPH-1011

Figure 48



WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,1000 SEC,140 DEG F,TPH-1011

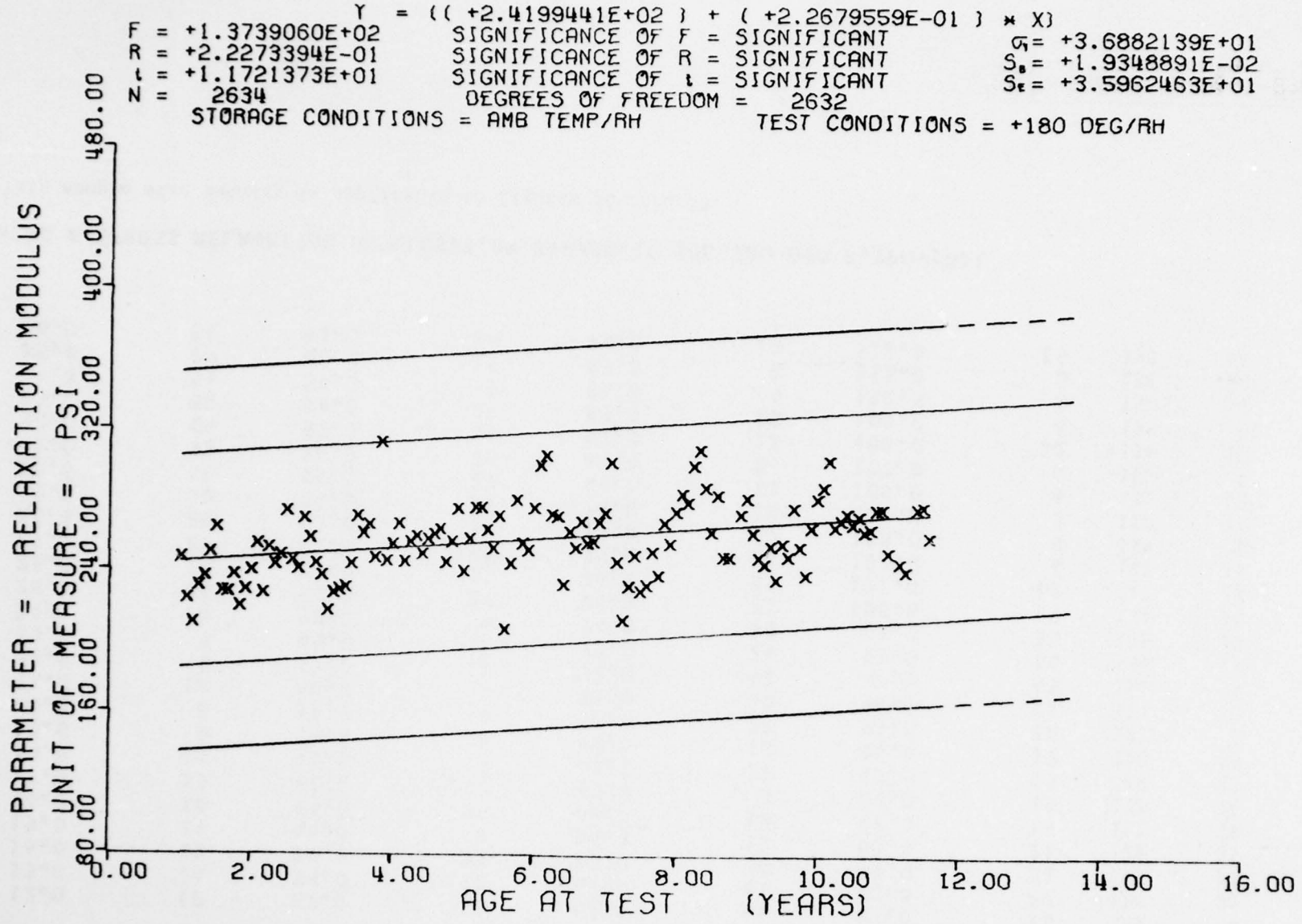
Figure 49

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
12.0	12	37.0	18	62.0	46	87.0	15	113	48
13.0	24	38.0	12	63.0	21	88.0	27	114	36
14.0	12	39.0	27	64.0	30	89.0	21	115	12
15.0	24	40.0	18	65.0	12	90.0	21	116	33
16.0	18	41.0	18	66.0	12	91.0	15	117	18
17.0	33	42.0	12	67.0	3	92.0	15	118	14
18.0	18	43.0	9	68.0	12	93.0	15	119	15
19.0	9	44.0	3	69.0	18	94.0	17	120	23
20.0	6	45.0	6	70.0	20	95.0	18	121	6
21.0	18	46.0	3	71.0	30	96.0	51	122	3
22.0	9	47.0	12	72.0	48	97.0	45	123	9
23.0	9	48.0	6	73.0	24	98.0	48	124	15
24.0	30	49.0	6	74.0	30	99.0	33	125	15
25.0	35	50.0	27	75.0	27	100.0	17	126	18
26.0	24	51.0	51	76.0	33	101.0	12	127	;2
27.0	24	52.0	53	77.0	24	102.0	6	;28	12
28.0	26	53.0	15	78.0	39	103.0	9	129	6
29.0	50	54.0	27	79.0	15	104.0	3	130	21
30.0	42	55.0	27	80.0	18	105.0	6	131	42
31.0	33	56.0	24	81.0	21	107.0	6	132	9
32.0	54	57.0	36	82.0	12	108.0	12	134	15
33.0	30	58.0	24	83.0	15	109.0	6	135	6
34.0	51	59.0	9	84.0	9	110.0	6	137	12
35.0	27	60.0	15	85.0	3	111.0	3	138	54
36.0	51	61.0	24	86.0	12	112.0	24	139	44

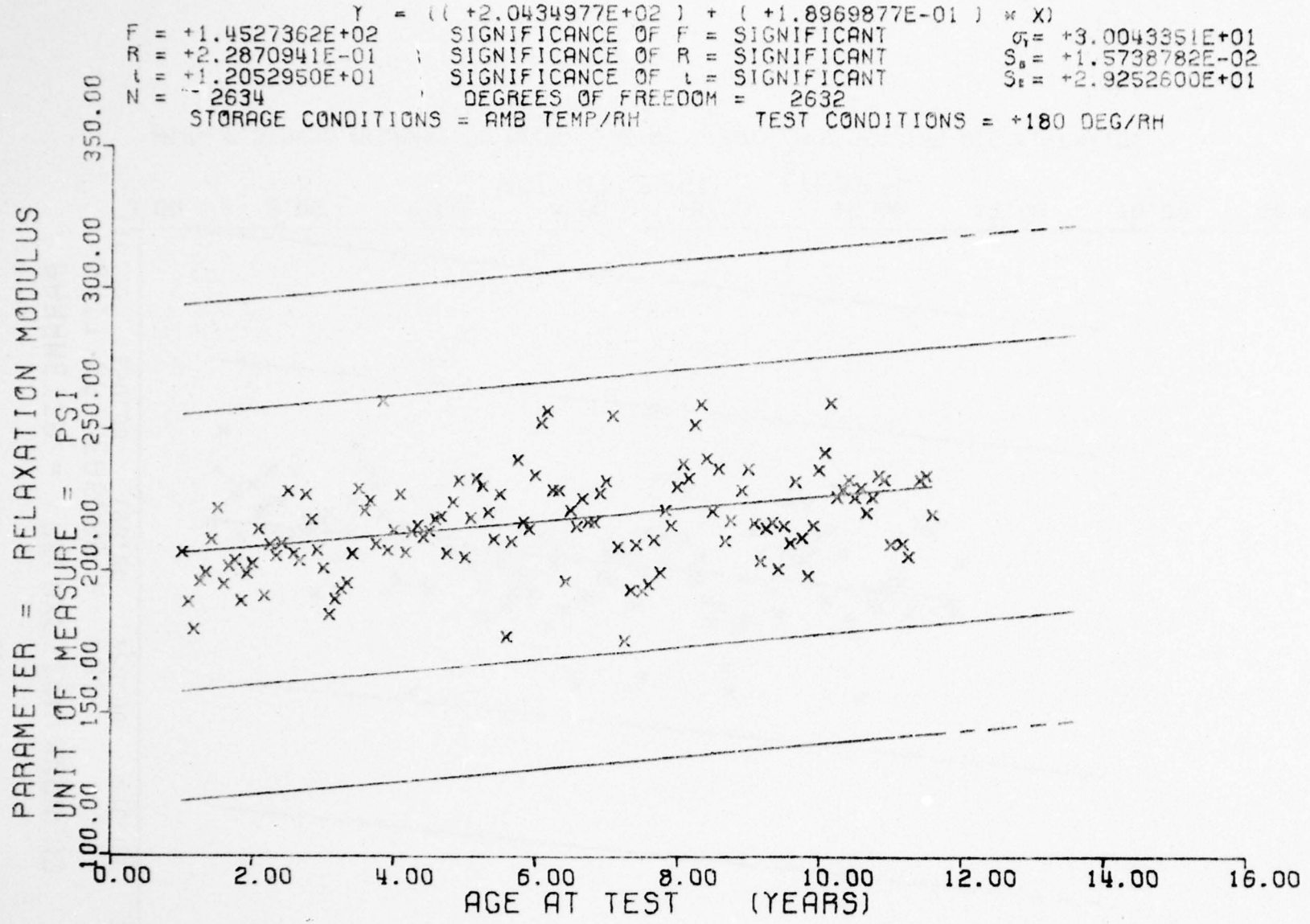
WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,10 SEC,180 DEG F,TPH-1011

This sample size summary is applicable to figures 50 thru 53.



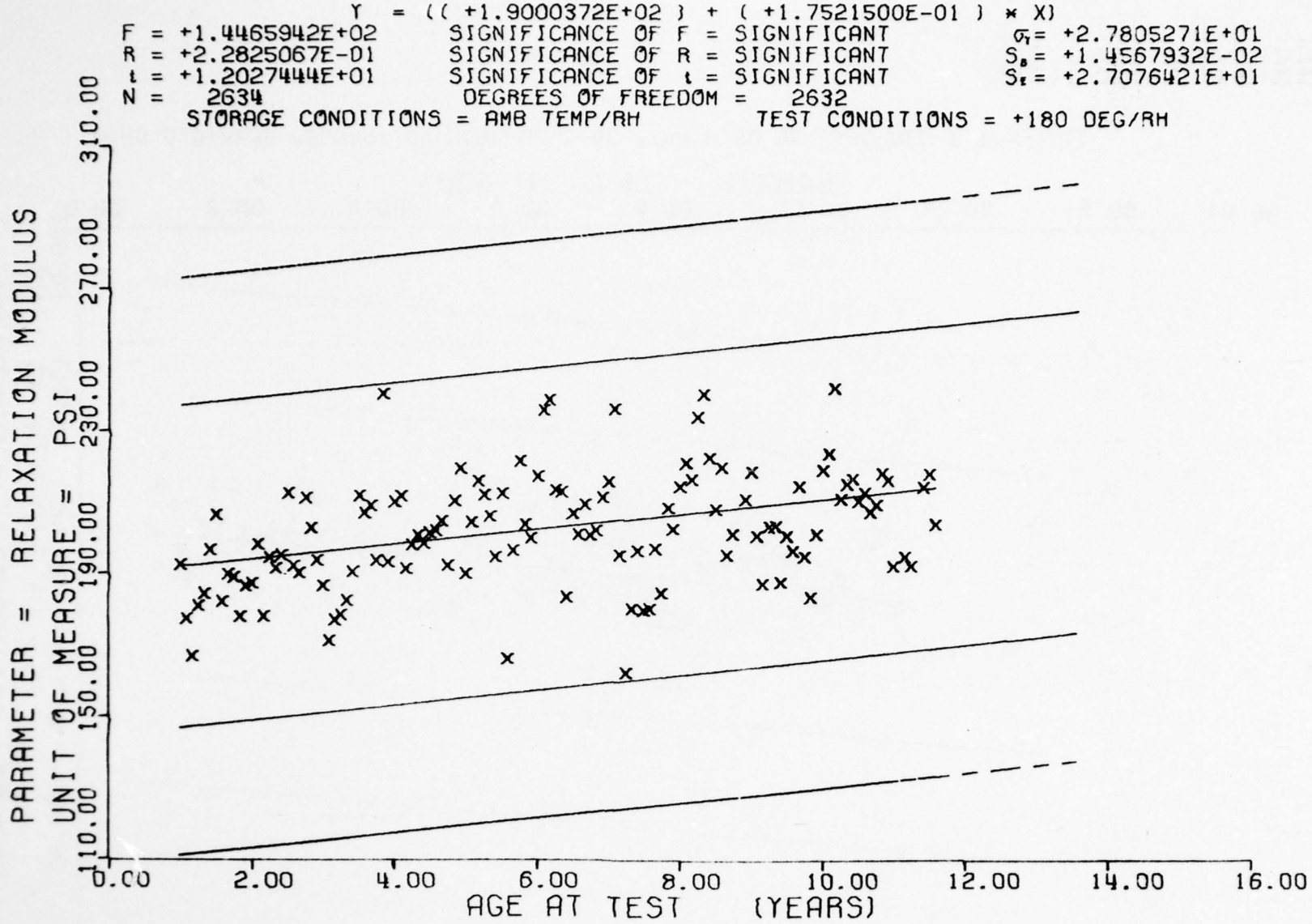
WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 10 SEC, 180 DEG F, TPH-1011

Figure 50



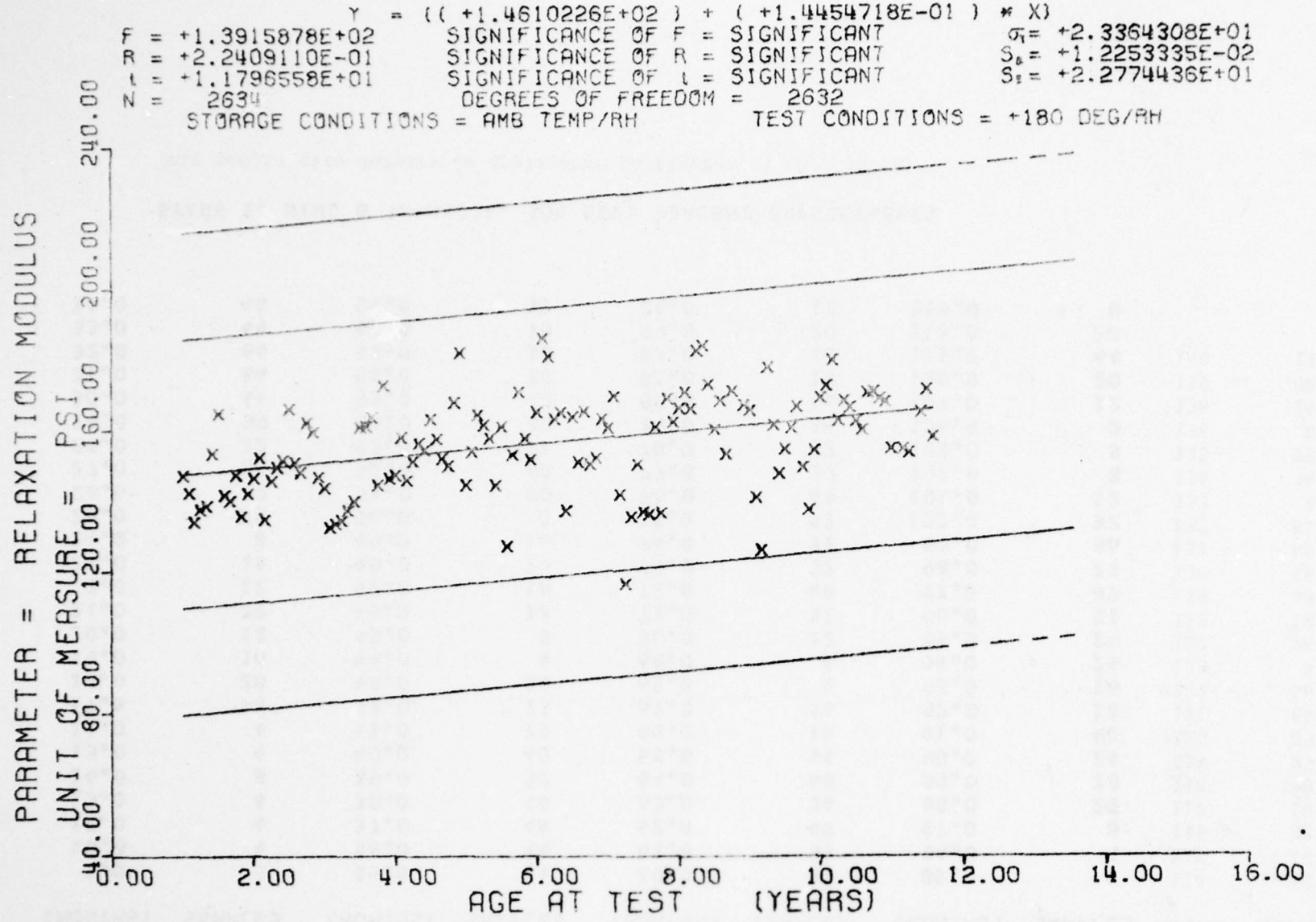
WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 50 SEC, 180 DEG F, TPH-1011

Figure 51



WING 6, STRESS RELAXATION MODULUS, 3.0% STRAIN, 100 SEC, 180 DEG F, TPH-101

Figure 52



WING 6,STRESS RELAXATION MODULUS,3.0% STRAIN,1000 SEC,180 DEG F,TPH-1011

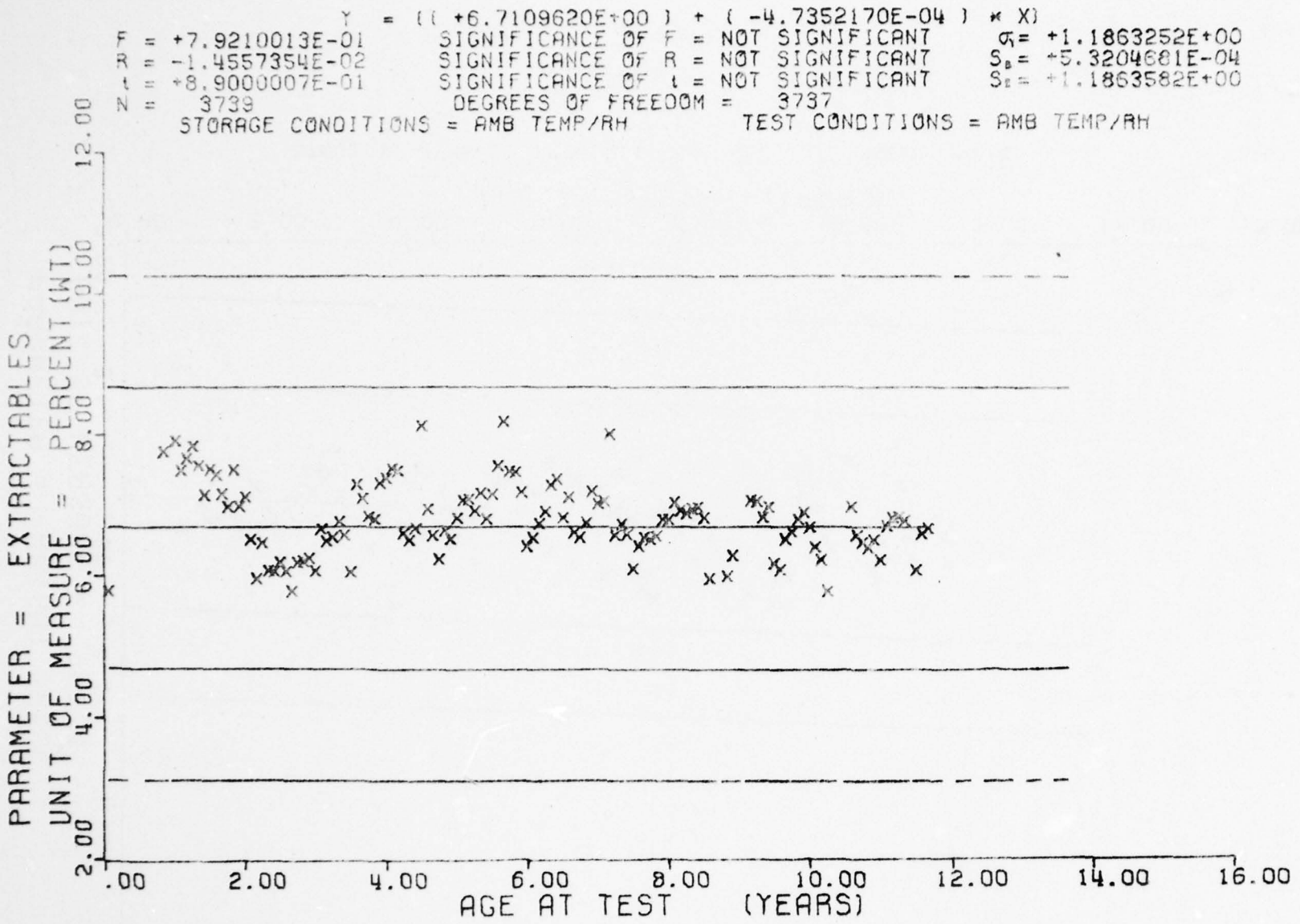
Figure 53

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
1.0	3	35.0	64	60.0	32	85.0	9	114	48
10.0	4	36.0	44	61.0	31	86.0	4	115	48
12.0	4	37.0	48	62.0	40	87.0	8	116	32
13.0	4	38.0	44	63.0	36	88.0	20	117	19
14.0	8	39.0	32	64.0	48	89.0	28	118	108
15.0	4	40.0	40	65.0	44	90.0	24	119	95
16.0	4	41.0	28	66.0	16	91.0	40	120	88
17.0	12	42.0	12	67.0	16	92.0	16	121	64
18.0	28	43.0	16	68.0	8	93.0	16	122	56
19.0	16	44.0	4	69.0	8	94.0	24	123	4
20.0	12	45.0	8	70.0	12	95.0	24	127	24
21.0	28	46.0	12	71.0	32	96.0	31	128	8
22.0	12	47.0	16	72.0	48	97.0	39	129	40
23.0	16	48.0	24	73.0	32	98.0	28	130	16
24.0	8	49.0	16	74.0	72	99.0	36	131	66
25.0	28	50.0	8	75.0	52	100.0	32	132	64
26.0	32	51.0	20	76.0	40	101.0	12	133	4
27.0	24	52.0	60	77.0	32	102.0	8	134	24
28.0	32	53.0	71	78.0	42	103.0	8	135	28
29.0	39	54.0	38	79.0	34	106.0	8	136	8
30.0	44	55.0	42	80.0	46	107.0	12	138	26
31.0	64	56.0	70	81.0	19	110.0	20	139	106
32.0	64	57.0	36	82.0	16	111.0	44	140	19
33.0	44	58.0	70	83.0	20	112.0	20		
34.0	48	59.0	32	84.0	12	113.0	8		

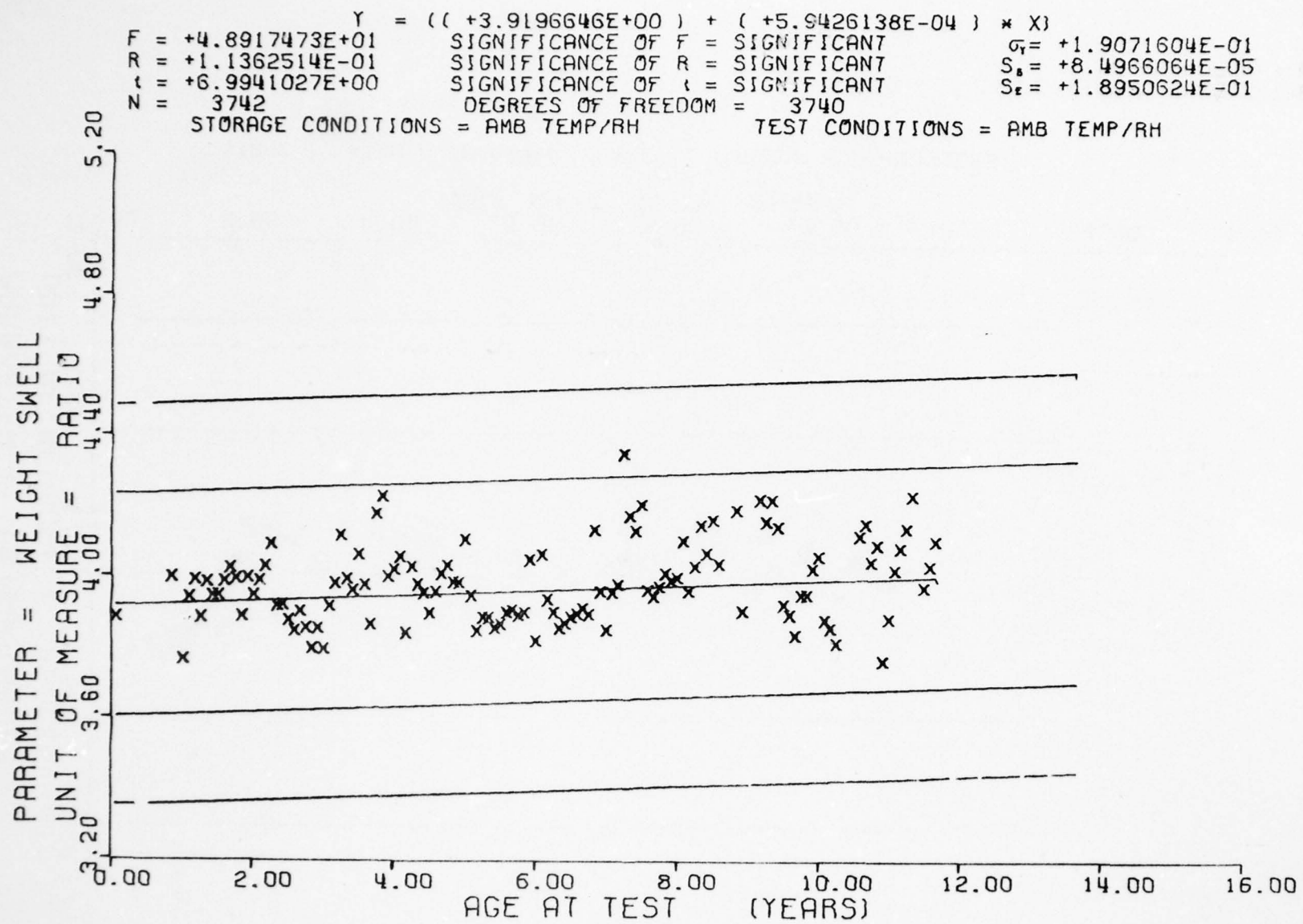
STAGE 1, WING 6 TP-H1011, SOL GEL, PERCENT EXTRACTABLES

This sample size summary is applicable to figures 54 thru 56.



STAGE 1, WING 6 TP-H1011, SOL GEL, PERCENT EXTRACTABLES

Figure 54

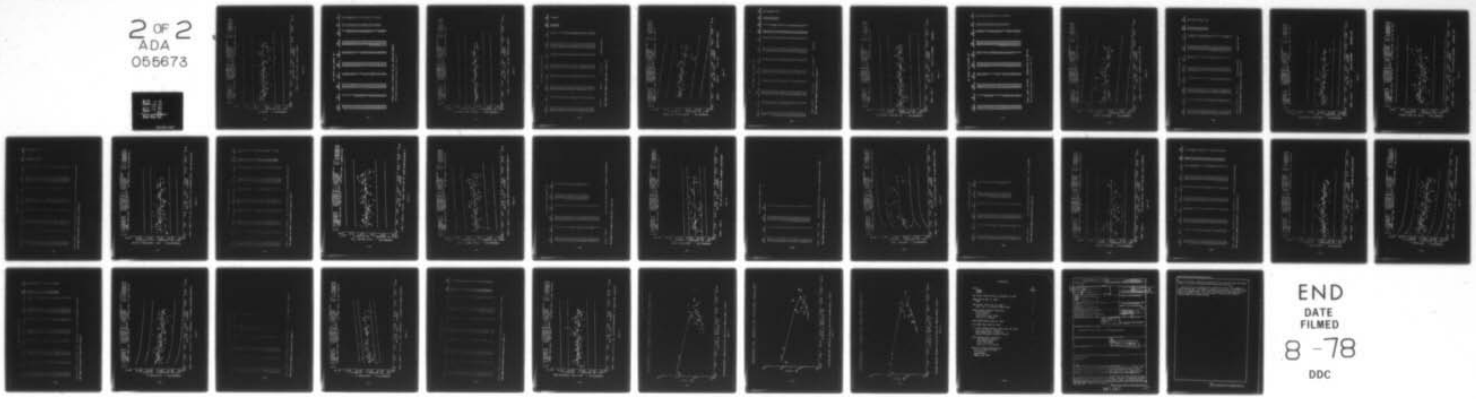


STAGE 1, WING 6, TP-H1011, SOL GEL, GEL SWELL RATIO

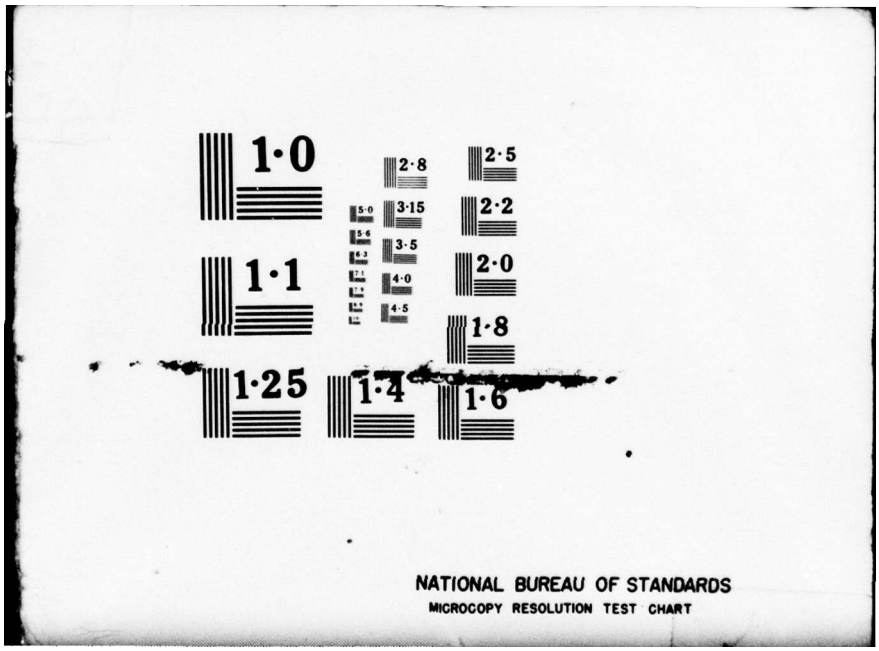
Figure 55

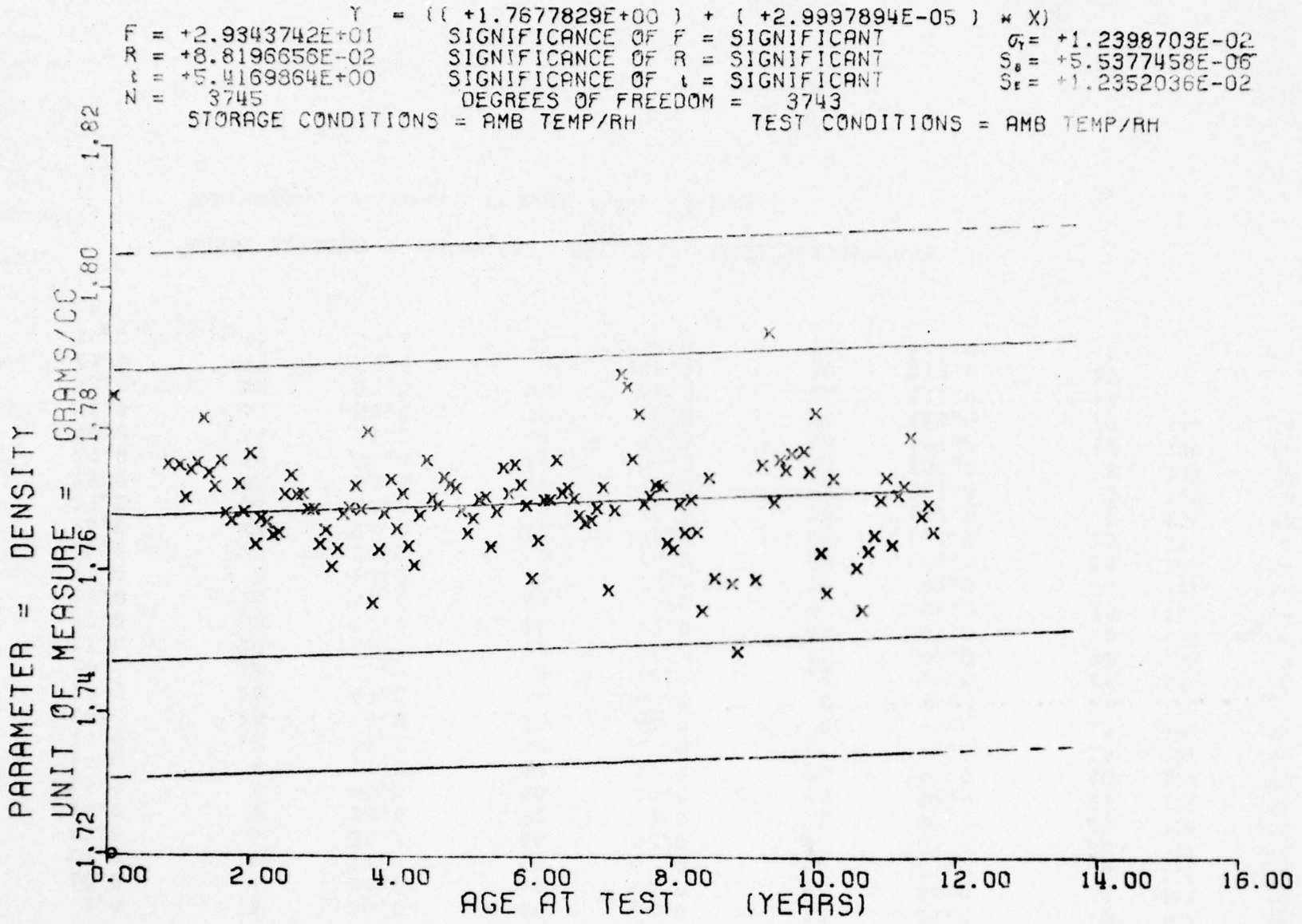
AD-A055 673 OGDEN AIR LOGISTICS CENTER HILL AFB UTAH PROPELLANT L--ETC F/G 21/9.2
PROPELLANT SURVEILLANCE REPORT LGM-30 F AND G STAGE 1, PHASE E,--ETC(U)
FEB 78 J A THOMPSON
UNCLASSIFIED MANCP-390(78) NL

2 OF 2
ADA
055673



END
DATE
FILMED
8-78
DDC


1·0
1·1
1·25
1·4
1·6
1·8
2·0
2·2
2·5
2·8
3·15
3·5
4·0
4·5
NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART



STAGE 1, WING 6, TP-H1011, SOL GEL, DENSITY

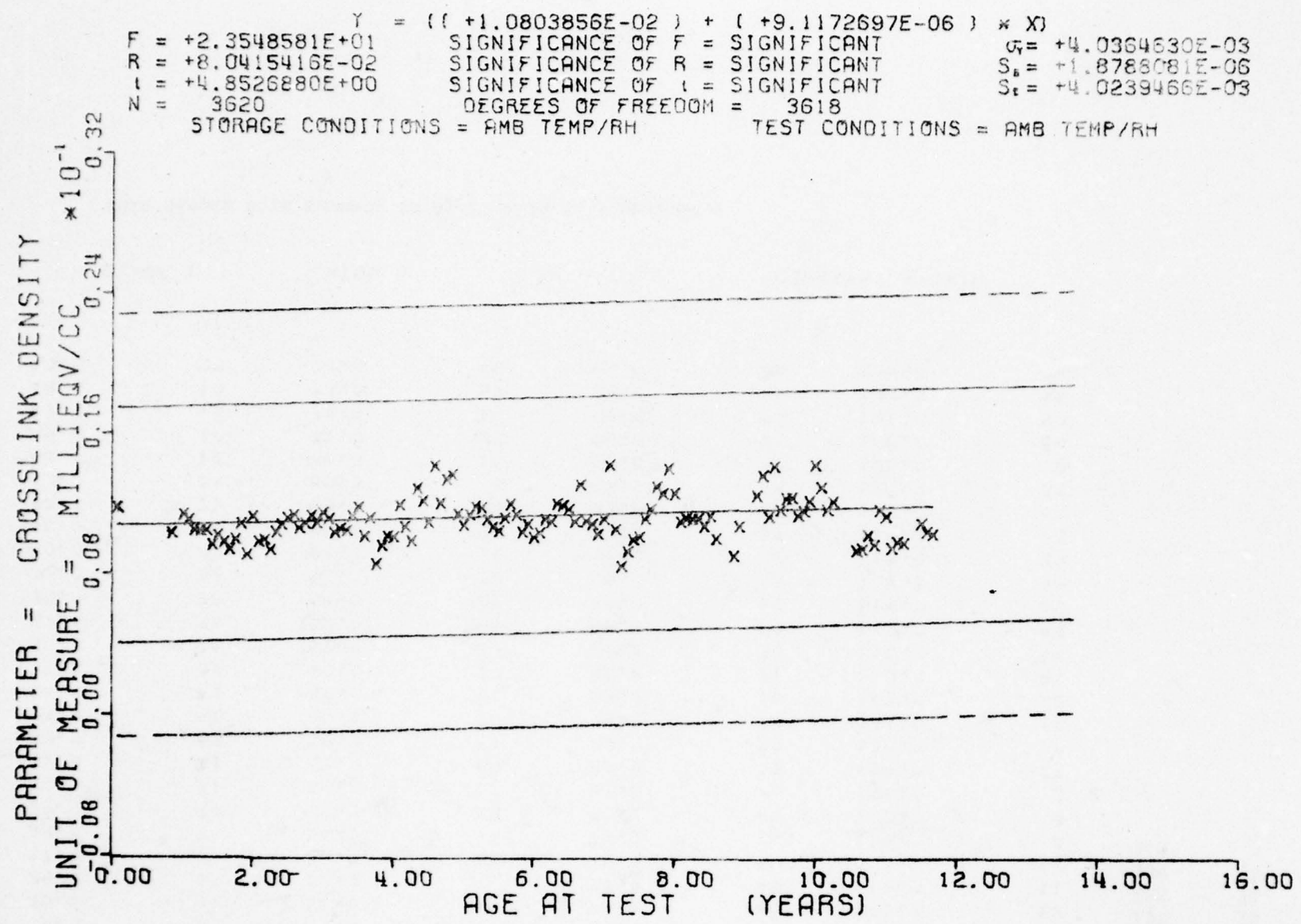
Figure 56

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
1.0	3	35.0	64	60.0	32	85.0	9	114	48
10.0	4	36.0	44	61.0	32	86.0	4	115	48
12.0	4	37.0	48	62.0	40	87.0	8	116	32
13.0	4	38.0	44	63.0	36	88.0	20	117	20
14.0	8	39.0	32	64.0	48	89.0	28	118	108
15.0	4	40.0	40	65.0	44	90.0	24	119	95
16.0	4	41.0	28	66.0	16	91.0	40	120	88
17.0	12	42.0	12	67.0	16	92.0	16	121	64
18.0	28	43.0	16	68.0	8	93.0	16	122	56
19.0	16	44.0	4	69.0	8	94.0	24	123	4
20.0	12	45.0	8	70.0	12	95.0	24	127	24
21.0	28	46.0	12	71.0	32	96.0	32	128	8
22.0	12	47.0	16	72.0	48	97.0	40	129	40
23.0	16	48.0	24	73.0	32	98.0	28	130	16
24.0	8	49.0	16	74.0	72	99.0	36	131	66
25.0	28	50.0	8	75.0	52	100.0	32	132	64
26.0	32	51.0	20	76.0	40	101.0	12	133	4
27.0	24	52.0	60	77.0	32	102.0	8	134	12
28.0	32	53.0	72	78.0	42	103.0	8	135	8
29.0	39	54.0	14	79.0	34	106.0	8	138	26
30.0	44	55.0	42	80.0	46	107.0	12	139	46
31.0	64	56.0	70	81.0	20	110.0	20	140	18
32.0	64	57.0	36	82.0	16	111.0	44		
33.0	44	58.0	70	83.0	20	112.0	20		
34.0	48	59.0	32	84.0	12	113.0	8		

STAGE 1, WING 6, TP-H1011, SOL GEL, CROSSLINK DENSITY

This sample size summary is applicable to figure 57.



STAGE 1, WING 6, TP-H1011, SOL GEL, CROSSLINK DENSITY

Figure 57

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
24.0	19	50.0	14	75.0	45	100.0	27	135	3
25.0	64	51.0	45	76.0	40	101.0	12	137	15
26.0	22	52.0	72	77.0	40	102.0	11	138	72
27.0	29	53.0	42	78.0	69	103.0	3	139	54
28.0	34	54.0	36	79.0	14	104.0	3	140	3
29.0	59	55.0	28	80.0	45	105.0	3		
30.0	31	56.0	62	81.0	36	106.0	3		
31.0	51	57.0	69	82.0	17	109.0	27		
32.0	67	58.0	51	83.0	29	110.0	30		
33.0	56	59.0	22	84.0	10	111.0	14		
34.0	61	60.0	20	85.0	18	112.0	22		
35.0	36	61.0	27	86.0	21	113.0	98		
36.0	26	62.0	63	87.0	30	114.0	44		
37.0	34	63.0	55	88.0	20	115.0	48		
38.0	26	64.0	62	89.0	40	116.0	45		
39.0	33	65.0	22	90.0	45	117.0	98		
40.0	30	66.0	10	91.0	30	118.0	28		
41.0	9	67.0	33	92.0	17	119.0	63		
42.0	21	68.0	20	93.0	13	120.0	69		
43.0	24	69.0	5	94.0	28	121.0	36		
44.0	10	70.0	15	95.0	30	122.0	6		
46.0	10	71.0	28	96.0	41	130.0	54		
47.0	15	72.0	15	97.0	83	131.0	90		
48.0	13	73.0	57	98.0	64	132.0	15		
49.0	25	74.0	45	99.0	38	134.0	24		

STAGE 1 WING 6 TP-H 1011 CONSTANT STRAIN

This sample size summary is applicable to figure 58.

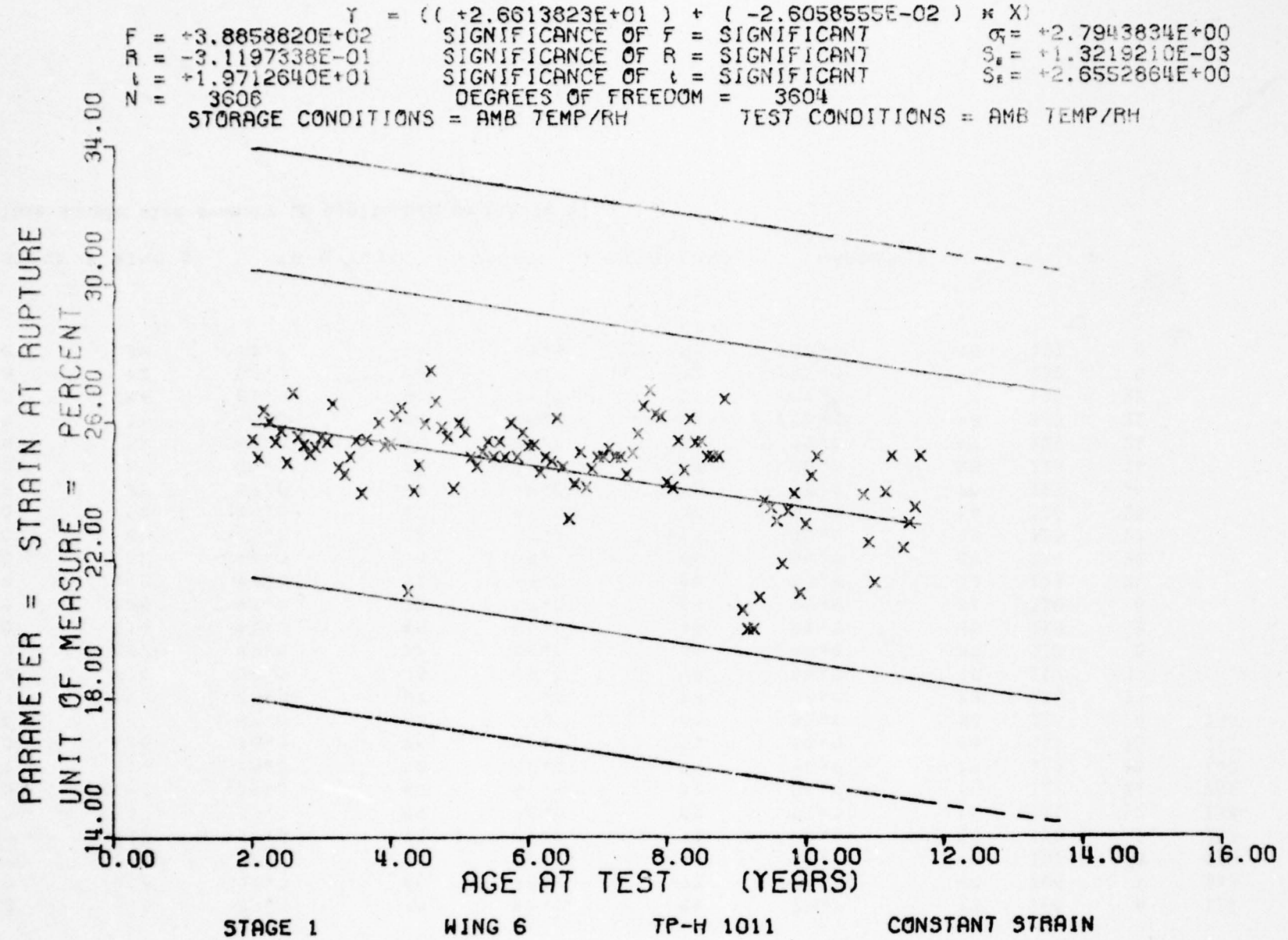

Y = ((+2.6613823E+01) + (-2.6058555E-02) * X)
F = +3.8858820E+02 SIGNIFICANCE OF F = SIGNIFICANT σ = +2.7943834E+00
R = -3.1197338E-01 SIGNIFICANCE OF R = SIGNIFICANT S_β = +1.3219210E-03
t = +1.9712640E+01 SIGNIFICANCE OF t = SIGNIFICANT S_ε = +2.6552864E+00
N = 3606 DEGREES OF FREEDOM = 3604
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
PARAMETER = STRAIN AT RUPTURE
UNIT OF MEASURE = PERCENT
14.00
18.00
22.00
26.00
30.00
34.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE 1 WING 6 TP-H 1011 CONSTANT STRAIN

Figure 58

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES	AGE MONTHS	NR SAMPLES
4.0	66	29.0	39	54.0	54	79.0	43	104	6	134	18
5.0	108	30.0	66	55.0	73	80.0	48	106	5	135	9
6.0	126	31.0	59	56.0	48	81.0	72	107	9	136	21
7.0	117	32.0	70	57.0	71	82.0	59	110	9	137	18
8.0	117	33.0	59	58.0	57	83.0	14	111	12	138	52
9.0	129	34.0	47	59.0	67	84.0	35	112	21	139	39
10.0	114	35.0	52	60.0	70	85.0	17	113	45	140	9
11.0	126	36.0	76	61.0	51	86.0	46	114	15	141	9
12.0	93	37.0	32	62.0	60	87.0	30	115	6	144	18
13.0	108	38.0	57	63.0	78	88.0	38	116	33		
14.0	110	39.0	40	64.0	58	89.0	30	117	33		
15.0	133	40.0	32	65.0	56	90.0	37	118	6		
16.0	114	41.0	45	66.0	45	91.0	25	119	9		
17.0	136	42.0	33	67.0	48	92.0	31	120	6		
18.0	108	43.0	31	68.0	94	93.0	32	123	21		
19.0	52	44.0	3	69.0	86	94.0	29	124	12		
20.0	27	45.0	35	70.0	110	95.0	53	125	27		
21.0	50	46.0	63	71.0	37	96.0	14	126	18		
22.0	33	47.0	40	72.0	75	97.0	70	127	24		
23.0	35	48.0	50	73.0	45	98.0	55	128	24		
24.0	57	49.0	28	74.0	91	99.0	49	129	24		
25.0	36	50.0	40	75.0	64	100.0	48	130	21		
26.0	66	51.0	91	76.0	71	101.0	8	131	32		
27.0	42	52.0	82	77.0	72	102.0	12	132	9		
28.0	36	53.0	24	78.0	69	103.0	16	133	9		

STAGE 1 WING 6 TP-H 1011 SHORE A, 10 SECOND HARDNESS

This sample size summary is applicable to figure 59

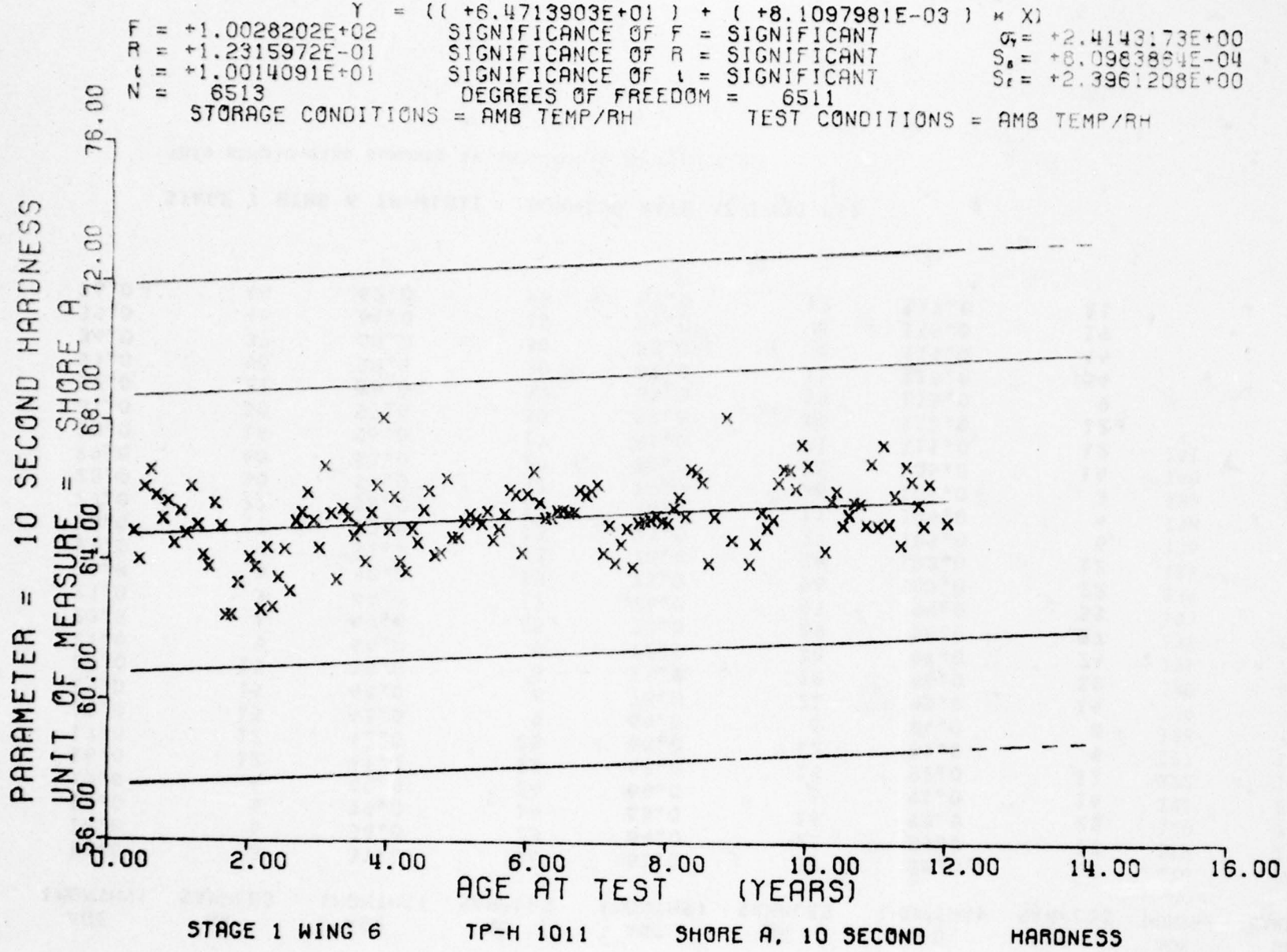

Y = ((+6.4713903E+01) + (+8.1097981E-03) * X)
F = +1.0028202E+02 SIGNIFICANCE OF F = SIGNIFICANT
R = +1.2315972E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +1.0014091E+01 SIGNIFICANCE OF t = SIGNIFICANT
N = 6513 DEGREES OF FREEDOM = 6511
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH
σT = +2.4143173E+00
Sb = +8.0983884E-04
Se = +2.3961208E+00
PARAMETER = 10 SECOND HARDNESS
UNIT OF MEASURE = SHORE A
56.00
60.00
64.00
68.00
72.00
76.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE 1 WING 6 TP-H 1011 SHORE A, 10 SECOND HARDNESS

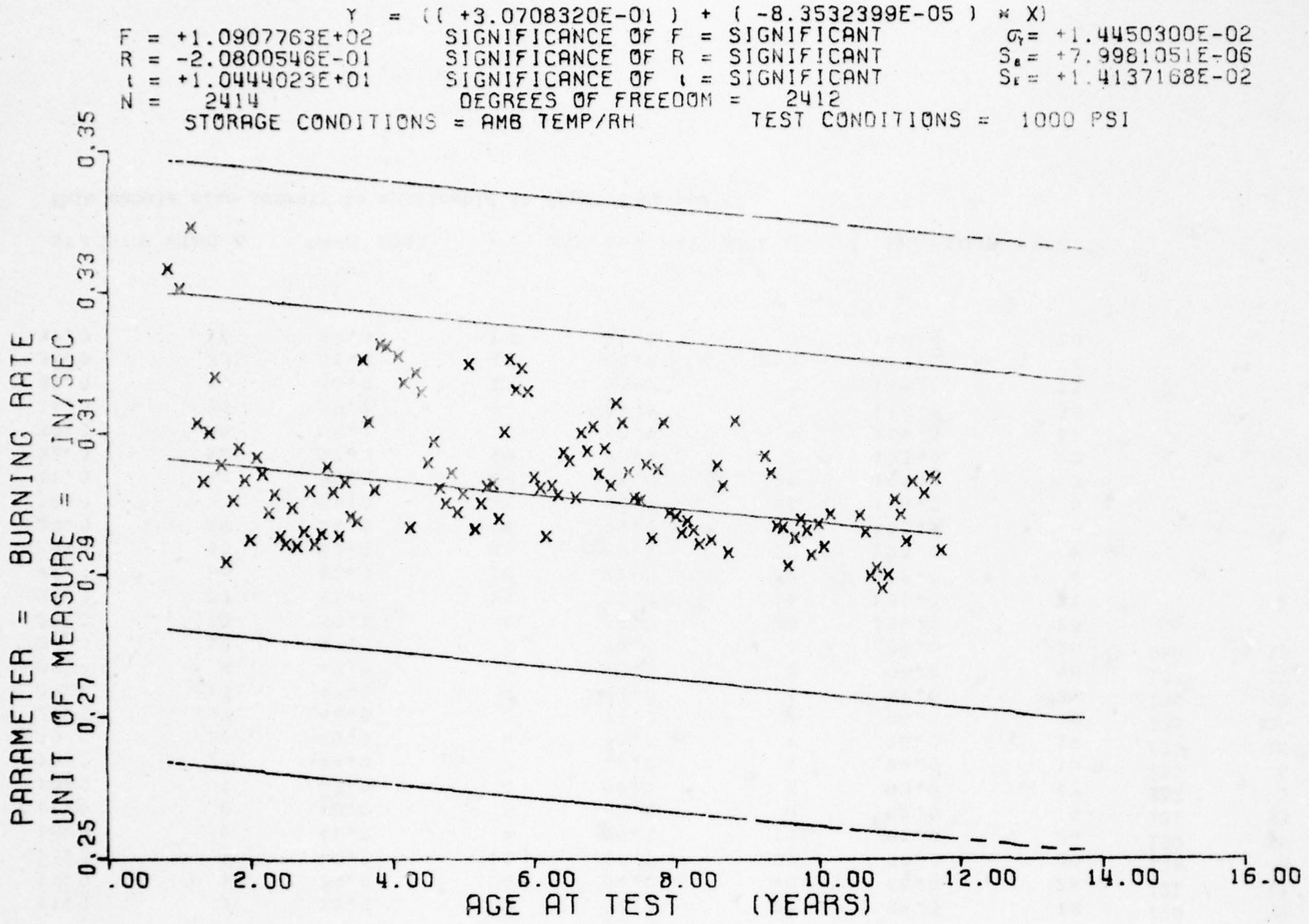
Figure 59

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
10.0	3	37.0	36	63.0	33	88.0	12	118	20
12.0	6	38.0	23	64.0	23	89.0	13	119	27
14.0	6	39.0	14	65.0	16	90.0	28	120	74
15.0	6	40.0	24	66.0	6	91.0	14	121	24
16.0	12	41.0	12	67.0	15	92.0	11	122	18
17.0	12	42.0	25	68.0	12	93.0	9	127	13
18.0	15	43.0	9	69.0	6	94.0	8	128	9
19.0	15	44.0	6	70.0	21	95.0	14	129	39
20.0	15	45.0	6	71.0	10	96.0	18	130	48
21.0	9	46.0	9	72.0	30	97.0	24	131	77
22.0	6	47.0	15	73.0	29	98.0	37	132	21
23.0	3	49.0	12	74.0	47	99.0	33	133	8
24.0	6	50.0	15	75.0	56	100.0	22	134	9
25.0	9	51.0	3	76.0	36	102.0	12	135	6
26.0	17	52.0	13	77.0	27	103.0	6	136	6
27.0	27	53.0	12	78.0	11	104.0	4	138	6
28.0	30	54.0	32	79.0	36	105.0	3	139	29
29.0	40	55.0	27	80.0	15	106.0	14	140	12
30.0	18	56.0	17	81.0	21	111.0	12	141	12
31.0	30	57.0	30	82.0	15	112.0	12		
32.0	31	58.0	39	83.0	15	113.0	9		
33.0	46	59.0	30	84.0	11	114.0	54		
34.0	32	60.0	38	85.0	6	115.0	44		
35.0	46	61.0	15	86.0	6	116.0	19		
36.0	46	62.0	40	87.0	12	117.0	21		

STAGE I WING 6 TP-H1011 BURNING RATE AT 1000 PSI

This sample size summary is applicable to figure 60



STAGE I WING 6 TP-H1011 BURNING RATE AT 1000 PSI

Figure 60

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
11.0	1	39.0	2	63.0	20	88.0	12	120	39
14.0	1	39.0	4	64.0	40	89.0	24	121	12
15.0	1	40.0	11	65.0	27	90.0	36	129	3
16.0	8	41.0	4	66.0	18	91.0	24	130	36
17.0	6	42.0	9	67.0	8	92.0	9	131	33
18.0	7	43.0	4	68.0	5	93.0	17	132	5
19.0	13	44.0	7	69.0	4	94.0	15	133	6
20.0	20	45.0	4	70.0	7	95.0	19	134	18
21.0	7	46.0	3	71.0	2	96.0	18	135	25
22.0	13	47.0	7	72.0	6	97.0	38	136	3
23.0	9	48.0	1	73.0	2	98.0	40	139	12
24.0	13	49.0	9	74.0	1	99.0	26	140	12
25.0	22	50.0	4	75.0	30	100.0	23		
26.0	27	51.0	14	76.0	26	101.0	21		
27.0	36	52.0	18	77.0	22	102.0	8		
28.0	33	53.0	35	78.0	13	103.0	6		
29.0	37	54.0	31	79.0	7	105.0	9		
30.0	24	55.0	25	80.0	21	106.0	6		
31.0	51	56.0	18	81.0	24	108.0	3		
32.0	42	57.0	19	82.0	7	113.0	3		
33.0	54	58.0	16	83.0	9	114.0	11		
34.0	39	59.0	24	84.0	9	115.0	56		
35.0	47	60.0	13	85.0	3	116.0	55		
36.0	33	61.0	10	86.0	3	117.0	7		
37.0	10	62.0	17	87.0	3	118.0	10		

STAGE 1 WING 6 TP-H 1011 MAXIMUM PRESSURE PRESSURE TIME

This sample size summary is applicable to figures 61 and 62.

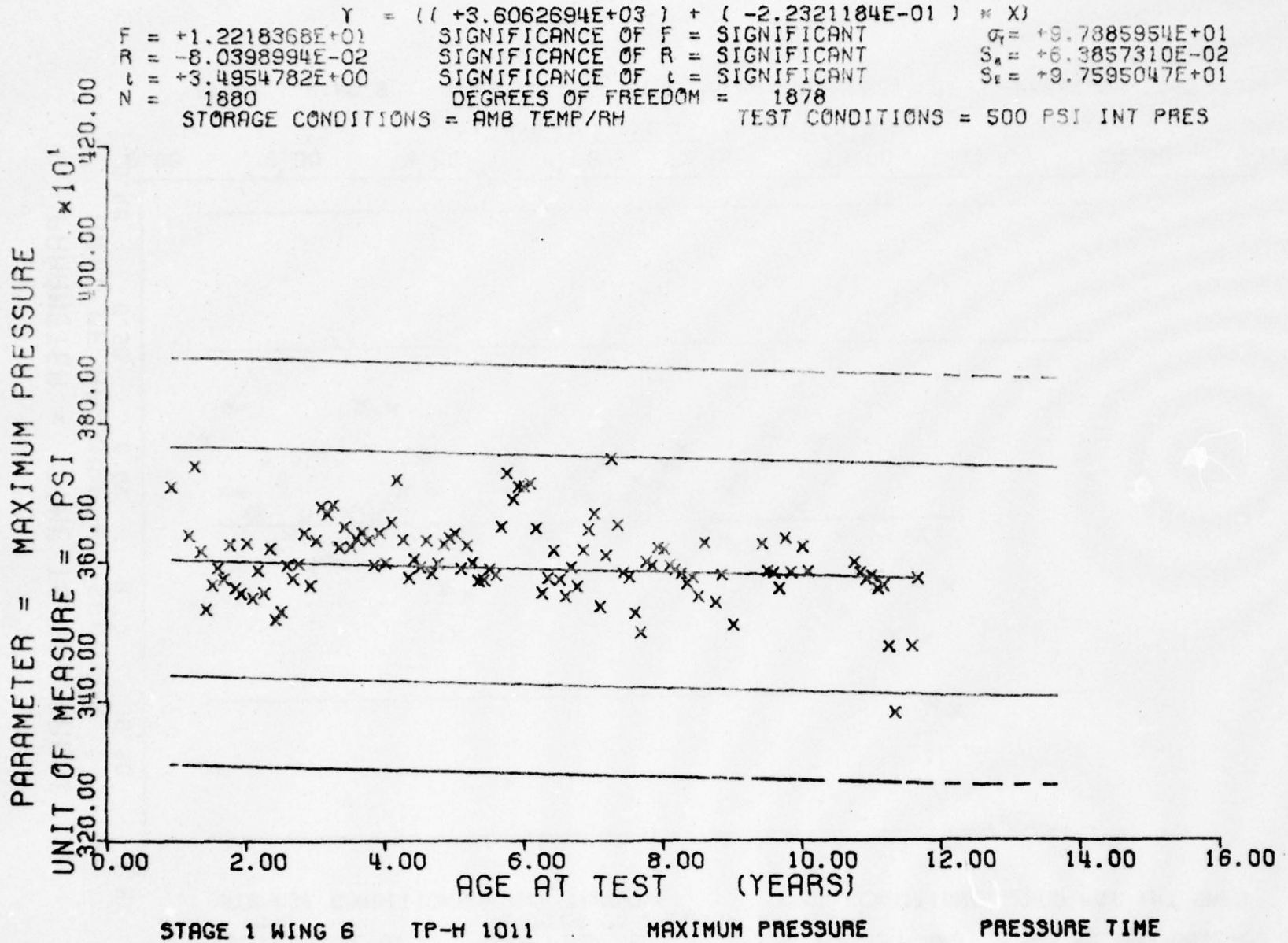

Y = ((+3.6062694E+03) + (-2.2321184E-01) * X)
F = +1.2218368E+01 SIGNIFICANCE OF F = SIGNIFICANT σT = +9.7885954E+01
R = -8.0398994E-02 SIGNIFICANCE OF R = SIGNIFICANT Se = +6.3857310E-02
t = +3.4954782E+00 SIGNIFICANCE OF t = SIGNIFICANT St = +9.7595047E+01
N = 1880 DEGREES OF FREEDOM = 1878
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 500 PSI INT PRES
PARAMETER = MAXIMUM PRESSURE
UNIT OF MEASURE = PSI *10¹
320.00
340.00
360.00
380.00
400.00
420.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE 1 WING 6 TP-H 1011 MAXIMUM PRESSURE PRESSURE TIME

Figure 61

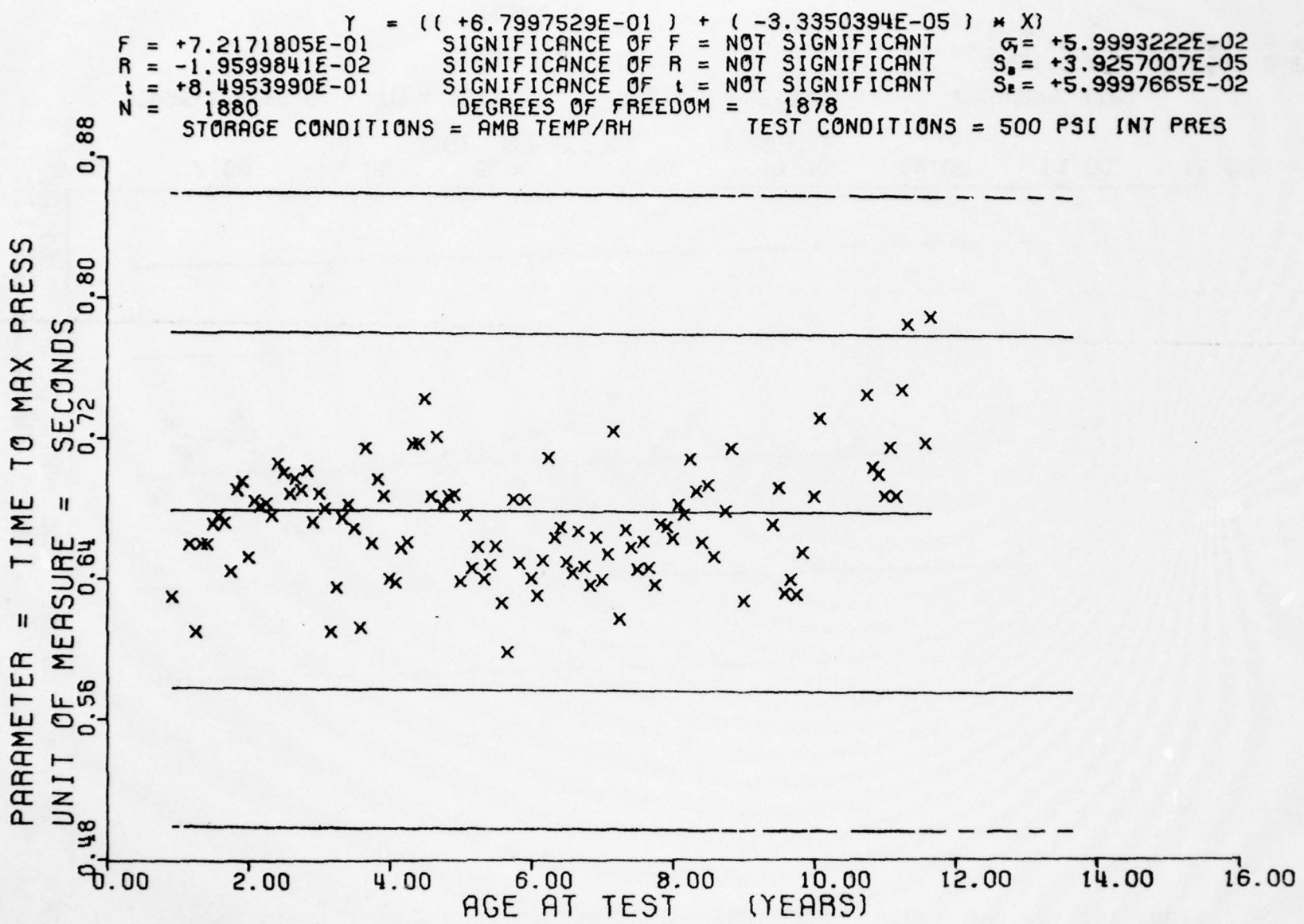

Y = ((+6.7997529E-01) + (-3.3350394E-05) * X)
F = +7.2171805E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT σ = +5.9993222E-02
R = -1.9599841E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_b = +3.9257007E-05
t = +8.4953990E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +5.9997665E-02
N = 1880 DEGREES OF FREEDOM = 1878
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 500 PSI INT PRES
PARAMETER = TIME TO MAX PRESS
UNIT OF MEASURE = SECONDS
0.88
0.80
0.72
0.64
0.56
0.48
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE 1 WING 6 TP-H 1011 TIME TO MAXIMUM PRESSURE PRESSURE TIME

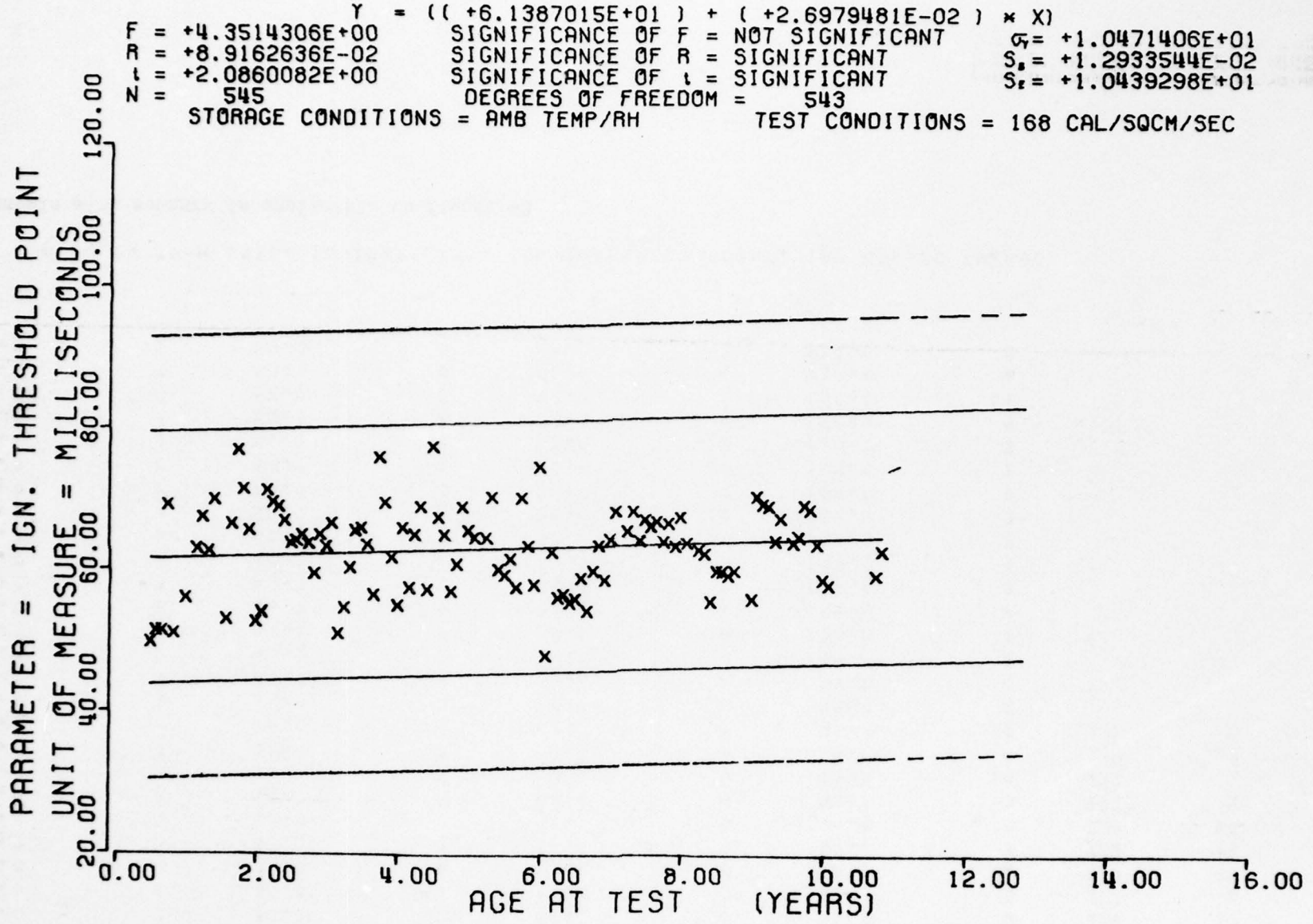
Figure 62

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
7.0	7	35.0	2	60.0	6	86.0	2	116	19
8.0	6	36.0	14	61.0	3	88.0	3	117	6
9.0	3	37.0	6	63.0	5	89.0	4	118	15
10.0	6	38.0	3	64.0	8	90.0	7	119	21
11.0	1	39.0	2	65.0	5	91.0	8	120	26
13.0	6	40.0	3	66.0	6	92.0	3	121	9
15.0	3	41.0	3	67.0	9	93.0	14	122	1
16.0	2	42.0	3	68.0	3	94.0	6	130	3
17.0	3	43.0	4	69.0	5	95.0	5	131	6
18.0	2	44.0	3	70.0	6	96.0	2		
20.0	2	45.0	2	71.0	4	97.0	6		
21.0	2	46.0	1	72.0	3	98.0	2		
22.0	1	47.0	5	73.0	4	100.0	1		
23.0	6	48.0	5	74.0	1	101.0	2		
24.0	3	49.0	2	75.0	3	102.0	3		
25.0	3	50.0	4	76.0	10	103.0	1		
26.0	1	51.0	2	77.0	10	104.0	2		
27.0	3	52.0	4	78.0	12	105.0	3		
28.0	3	53.0	3	79.0	4	106.0	1		
29.0	6	54.0	4	80.0	10	109.0	1		
30.0	6	55.0	2	81.0	12	110.0	3		
31.0	7	56.0	2	82.0	4	111.0	6		
32.0	7	57.0	2	83.0	6	112.0	11		
33.0	7	58.0	3	84.0	4	113.0	4		
34.0	11	59.0	6	85.0	2	114.0	2		

STAGE 1 WING 6, TR-H 1011, IGNITABILITY, IGN THRESHOLD POINT, 168 CAL/SQ CM/SEC

This sample size summary is applicable to figure 63



STAGE 1 WING 6, TP-H 1011, IGNITABILITY, IGN THRESHOLD POINT, 168 CAL/SQ CM/SEC

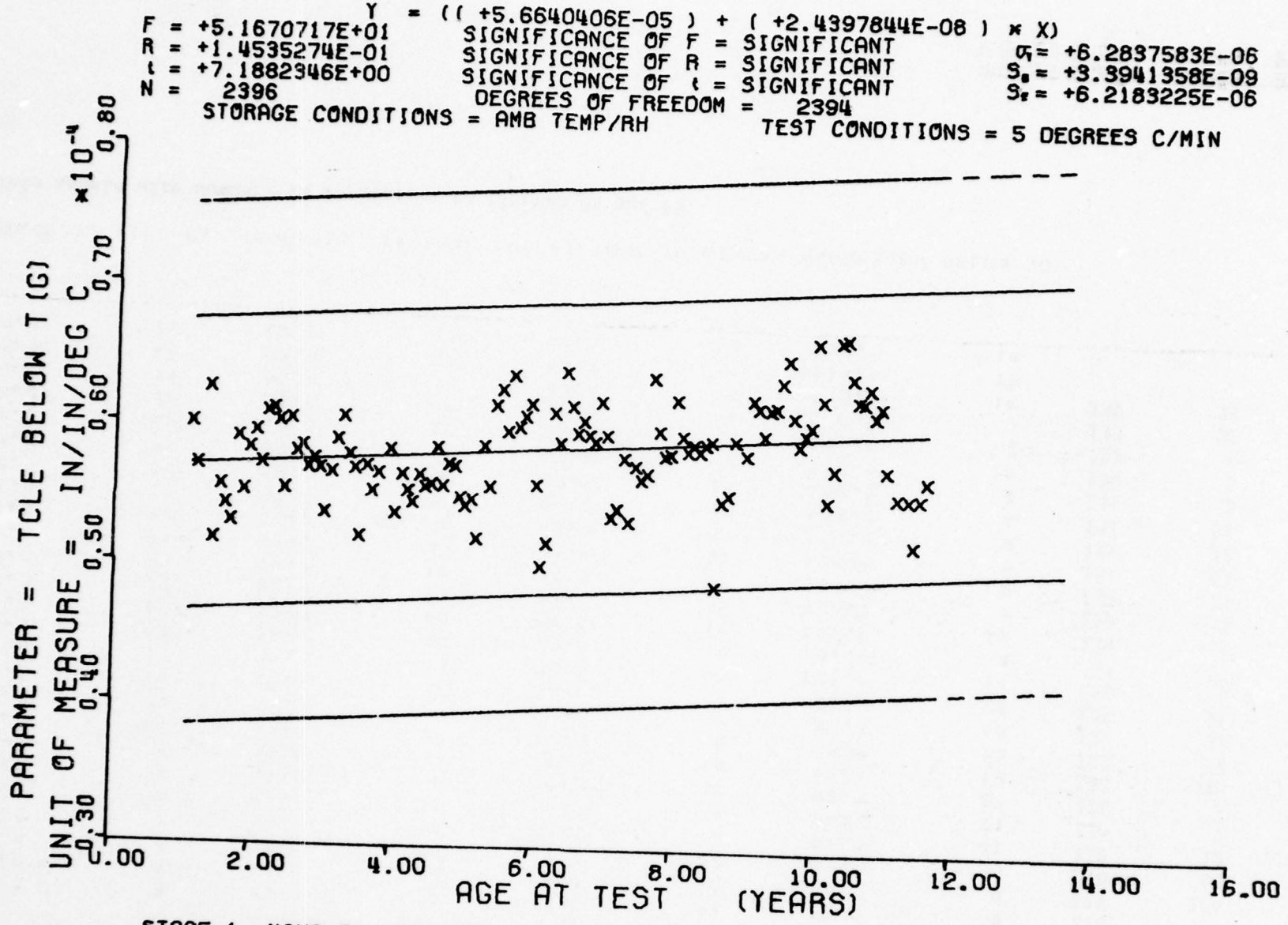
Figure 63

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
13.0	3	39.0	12	65.0	21	90.0	9	116	15
14.0	3	40.0	24	66.0	12	91.0	9	117	104
16.0	6	41.0	18	67.0	12	92.0	3	118	63
17.0	3	42.0	12	68.0	13	93.0	21	119	12
18.0	9	43.0	12	69.0	24	94.0	21	120	9
19.0	4	44.0	6	70.0	12	95.0	29	121	5
20.0	8	45.0	9	71.0	18	96.0	12	122	28
21.0	19	47.0	15	72.0	6	97.0	30	123	2
22.0	24	48.0	3	73.0	3	98.0	68	124	21
23.0	12	49.0	6	74.0	3	99.0	30	125	27
24.0	18	50.0	9	75.0	9	100.0	19	126	9
25.0	42	51.0	39	76.0	19	101.0	2	127	27
26.0	15	52.0	45	77.0	18	102.0	12	128	18
27.0	27	53.0	51	78.0	30	103.0	3	129	6
28.0	24	54.0	15	79.0	12	104.0	3	130	37
29.0	39	55.0	33	80.0	24	105.0	9	131	42
30.0	42	56.0	30	81.0	39	106.0	9	132	18
31.0	48	57.0	27	82.0	12	108.0	6	134	24
32.0	54	58.0	36	83.0	18	109.0	3	135	3
33.0	30	59.0	15	84.0	9	110.0	18	136	3
34.0	48	60.0	15	85.0	9	111.0	3	137	6
35.0	36	61.0	9	86.0	9	112.0	5	138	57
36.0	24	62.0	15	87.0	5	113.0	14	139	39
37.0	44	63.0	12	88.0	3	114.0	18		
38.0	15	64.0	15	89.0	12	115.0	18		

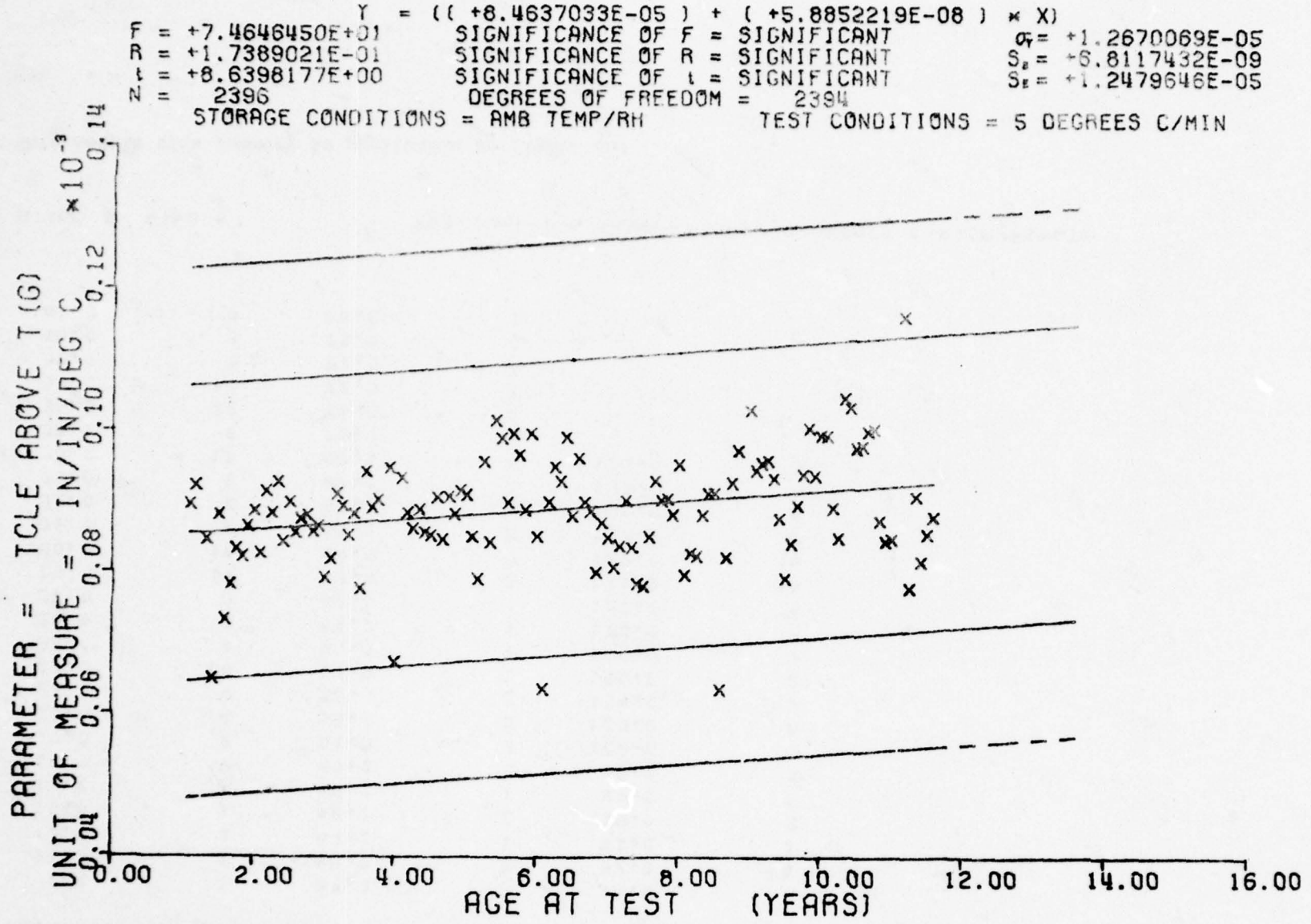
STAGE 1. WING 6. TP-H1011 THERMAL COEFFICIENT OF LINEAR EXPANSION BELOW TG

This sample size summary is applicable to figures 64 and 65.



STAGE 1, WING 6, TP-H1011 THERMAL COEFFICIENT OF LINEAR EXPANSION BELOW TG

Figure 64



STAGE 1, WING 6, TP-H1011, THERMAL COEFFICIENT OF LINEAR EXPANSION ABOVE TG

Figure 65

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.0	3	42.0	3	79.0	6
11.0	1	45.0	3	87.0	1
13.0	1	47.0	1	91.0	1
15.0	1	48.0	2	95.0	3
16.0	1	49.0	1	97.0	6
18.0	7	50.0	3	99.0	3
19.0	2	51.0	3	102.0	3
20.0	4	53.0	3	103.0	6
21.0	4	56.0	1	104.0	3
22.0	14	57.0	3	105.0	2
24.0	4	59.0	1	106.0	2
26.0	2	61.0	1	110.0	2
27.0	2	62.0	1	120.0	4
29.0	14	63.0	2	121.0	10
30.0	10	64.0	3	122.0	16
31.0	8	65.0	2	123.0	2
32.0	2	66.0	1	131.0	4
33.0	2	67.0	4	132.0	8
34.0	10	69.0	4	133.0	3
35.0	9	70.0	1		
36.0	22	71.0	2		
37.0	12	72.0	1		
39.0	3	73.0	4		
40.0	3	75.0	2		
41.0	3	76.0	1		

STAGE 1 WING 6 TGA IGNITION TEMPERATURE, 9 DEGREE C RISE/MINUTE

This sample size summary is applicable to figure 66.

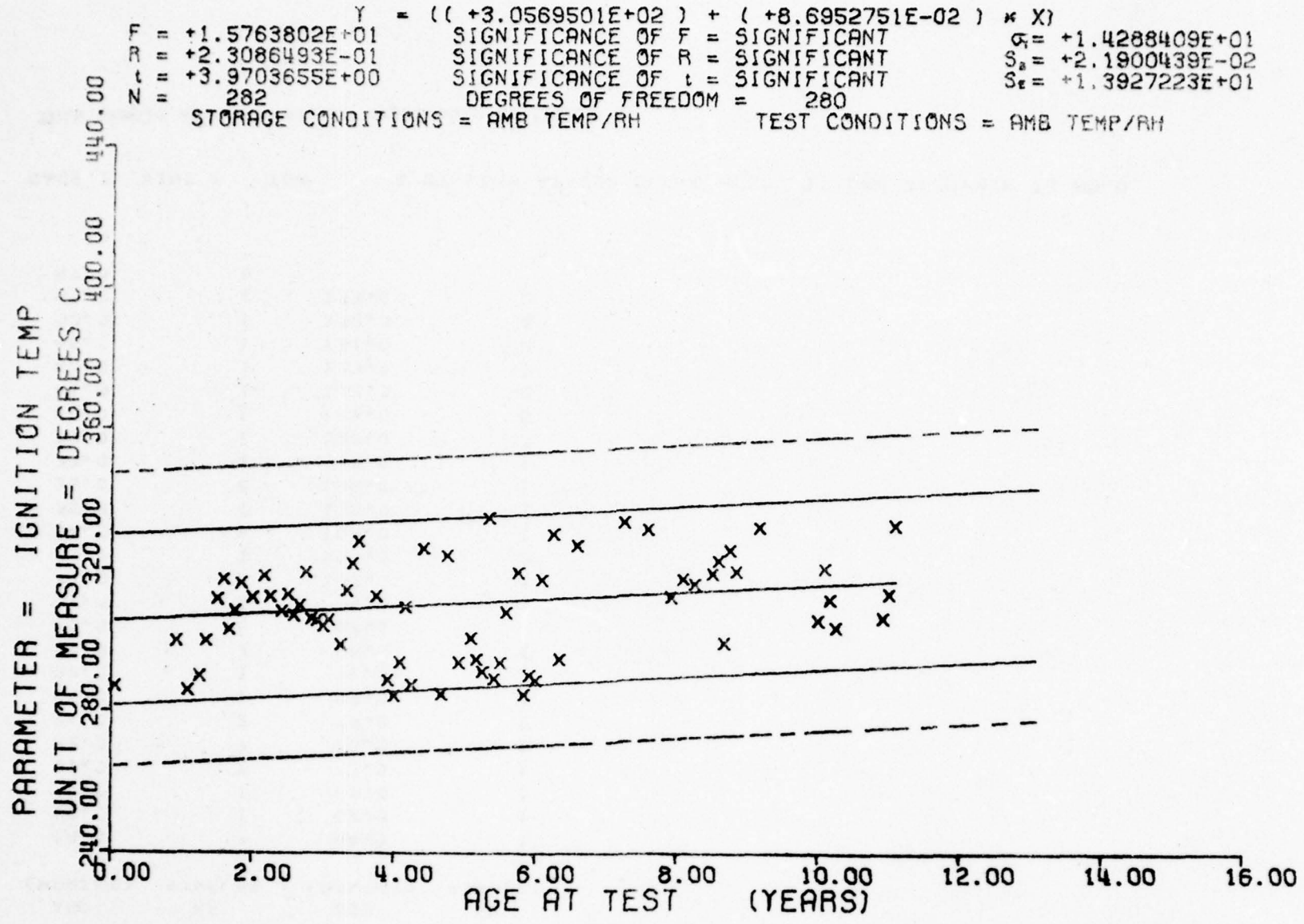

Y = ((+3.0569501E+02) + (+8.6952751E-02) * X)
F = +1.5763802E+01
SIGNIFICANCE OF F = SIGNIFICANT
σ_t = +1.4288409E+01
R = +2.3086493E-01
SIGNIFICANCE OF R = SIGNIFICANT
S_a = +2.1900439E-02
t = +3.9703655E+00
SIGNIFICANCE OF t = SIGNIFICANT
S_ε = +1.3927223E+01
N = 282
DEGREES OF FREEDOM = 280
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = AMB TEMP/RH
PARAMETER = IGNITION TEMP
UNIT OF MEASURE = DEGREES C
240.00
280.00
320.00
360.00
400.00
440.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE I WING 6
TGA IGNITION TEMPERATURE, 9 DEGREE C RISE/MINUTE

Figure 66

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
18.0	3	64.0	1
19.0	1	67.0	1
20.0	1	69.0	1
21.0	2	73.0	1
22.0	7	75.0	1
24.0	2	79.0	2
26.0	1	87.0	1
27.0	1	91.0	1
29.0	7	95.0	1
30.0	5	97.0	2
31.0	4	99.0	1
32.0	1	102.0	1
33.0	1	103.0	2
34.0	4	104.0	1
35.0	2	105.0	1
36.0	6	106.0	1
37.0	1	110.0	1
39.0	1	120.0	2
40.0	1	121.0	5
41.0	1	122.0	8
42.0	1	123.0	1
45.0	1	131.0	2
50.0	1	132.0	4
53.0	1	133.0	2
57.0	1		

SAGE I WING 6 TGA % WT LOSS AT 250 DEG C HOLD, 12 DEG RISE/MIN TO HOLD

This sample size summary is applicable to figure 67

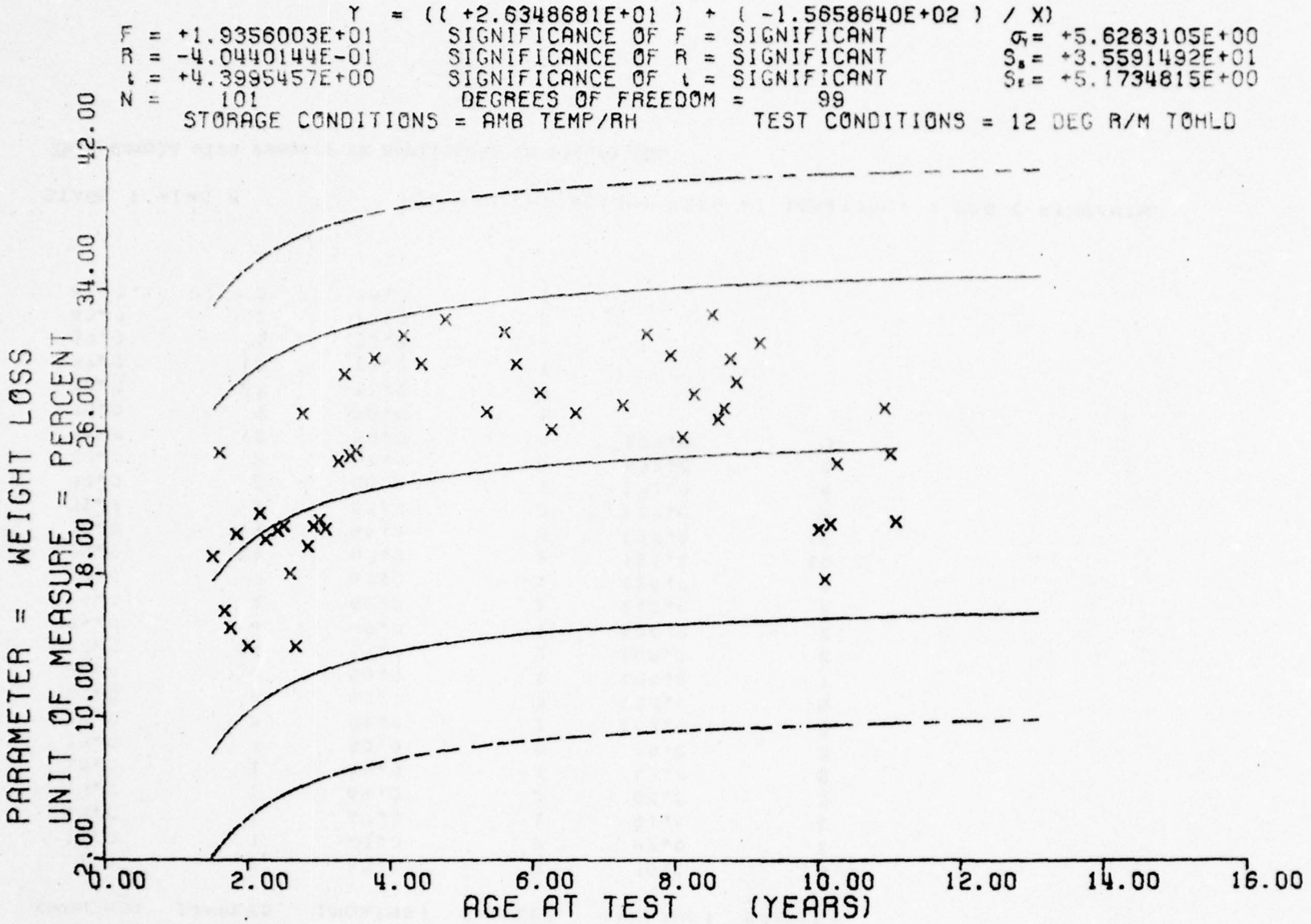

Y = ((+2.6348681E+01) + (-1.5658640E+02) / X)
F = +1.9356003E+01 SIGNIFICANCE OF F = SIGNIFICANT
R = -4.0440144E-01 SIGNIFICANCE OF R = SIGNIFICANT
t = +4.3995457E+00 SIGNIFICANCE OF t = SIGNIFICANT
N = 101 DEGREES OF FREEDOM = 99
STORAGE CONDITIONS = AMB TEMP/RH
TEST CONDITIONS = 12 DEG R/M TOHLD
PARAMETER = WEIGHT LOSS
UNIT OF MEASURE = PERCENT
2.00
10.00
18.00
26.00
34.00
42.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
SAGE I WING 6 TGA % WT LOSS AT 250 DEG C HOLD, 12 DEG RISE/MIN TO HOLD

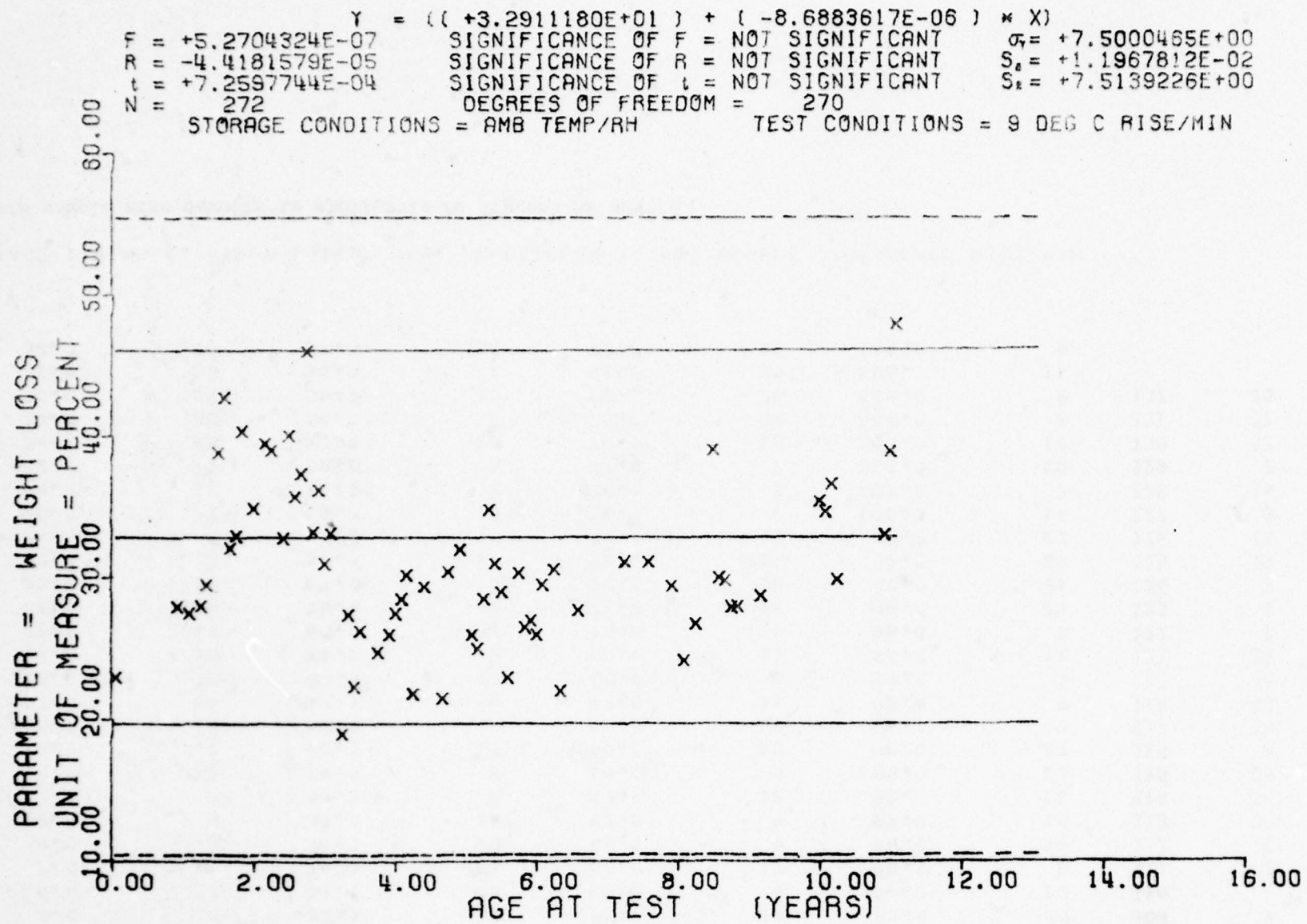
Figure 67

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
1.0	3	42.0	3	79.0	6
11.0	1	45.0	2	87.0	1
13.0	1	47.0	1	91.0	1
15.0	1	48.0	2	95.0	3
16.0	1	49.0	1	97.0	5
18.0	7	50.0	2	99.0	2
19.0	2	51.0	3	102.0	3
20.0	4	53.0	3	103.0	5
21.0	4	56.0	1	104.0	1
22.0	14	57.0	3	105.0	2
24.0	4	59.0	1	106.0	2
25.0	2	61.0	1	110.0	2
27.0	2	62.0	1	120.0	4
29.0	14	63.0	2	121.0	10
30.0	10	64.0	3	122.0	16
31.0	8	65.0	2	123.0	2
32.0	2	66.0	1	131.0	4
33.0	2	67.0	4	132.0	8
34.0	10	69.0	4	133.0	3
35.0	9	70.0	1		
36.0	22	71.0	2		
37.0	12	72.0	1		
39.0	1	73.0	4		
40.0	2	75.0	2		
41.0	3	76.0	1		

STAGE I WING 6 TGA PERCENT WEIGHT LOSS AT IGNITION, 8 DEG C RISE/MIN

This sample size summary is applicable to figure 68.



STAGE I WING 6 TGA PERCENT WEIGHT LOSS AT IGNITION, 9 DEG C RISE/MIN

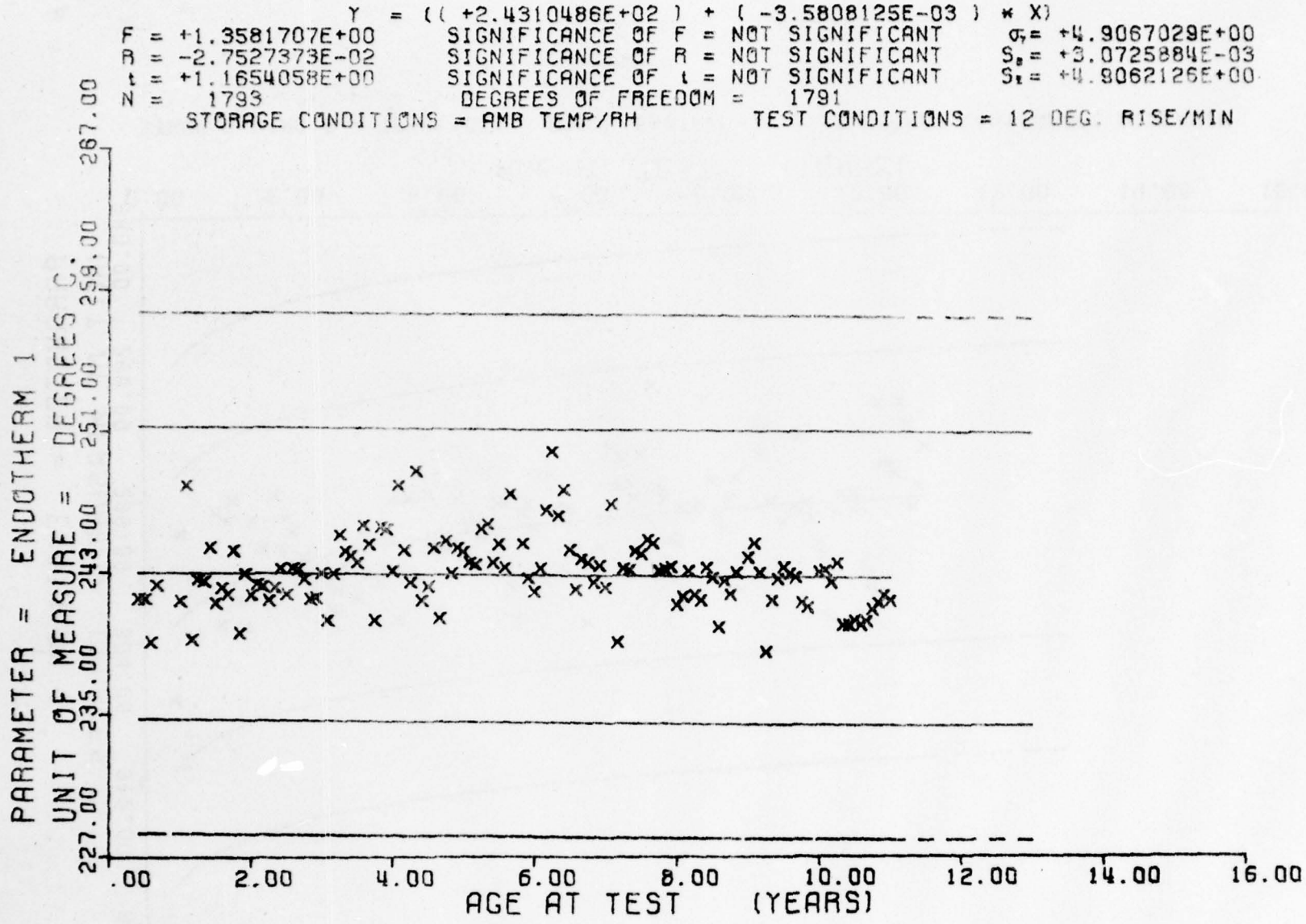
Figure 68

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
5.0	9	33.0	19	58.0	14	83.0	26	109	9
6.0	27	34.0	33	59.0	9	84.0	12	110	2
7.0	11	35.0	21	60.0	17	85.0	8	111	2
8.0	9	36.0	29	61.0	8	86.0	12	112	10
12.0	9	37.0	18	62.0	8	87.0	15	113	35
13.0	3	38.0	6	63.0	12	88.0	12	114	56
14.0	15	39.0	5	64.0	5	89.0	23	115	25
15.0	3	40.0	15	65.0	10	90.0	27	116	7
16.0	26	41.0	2	66.0	9	91.0	9	117	13
17.0	14	42.0	8	67.0	16	92.0	9	118	40
18.0	30	43.0	12	68.0	6	93.0	9	120	4
19.0	10	44.0	3	69.0	12	94.0	11	121	10
20.0	11	45.0	6	70.0	19	95.0	3	122	7
21.0	24	46.0	6	71.0	20	96.0	25	123	2
22.0	16	47.0	14	72.0	16	97.0	31	124	3
23.0	13	48.0	14	73.0	14	98.0	28	125	13
24.0	9	49.0	5	74.0	9	99.0	23	126	15
25.0	27	50.0	3	75.0	9	100.0	14	127	3
26.0	20	51.0	2	76.0	8	101.0	7	128	15
27.0	21	52.0	5	77.0	7	102.0	10	129	9
28.0	25	53.0	13	78.0	16	103.0	12	130	52
29.0	20	54.0	8	79.0	24	104.0	2	131	37
30.0	29	55.0	15	80.0	30	105.0	8	132	16
31.0	28	56.0	11	81.0	23	106.0	11		
32.0	20	57.0	12	82.0	18	108.0	6		

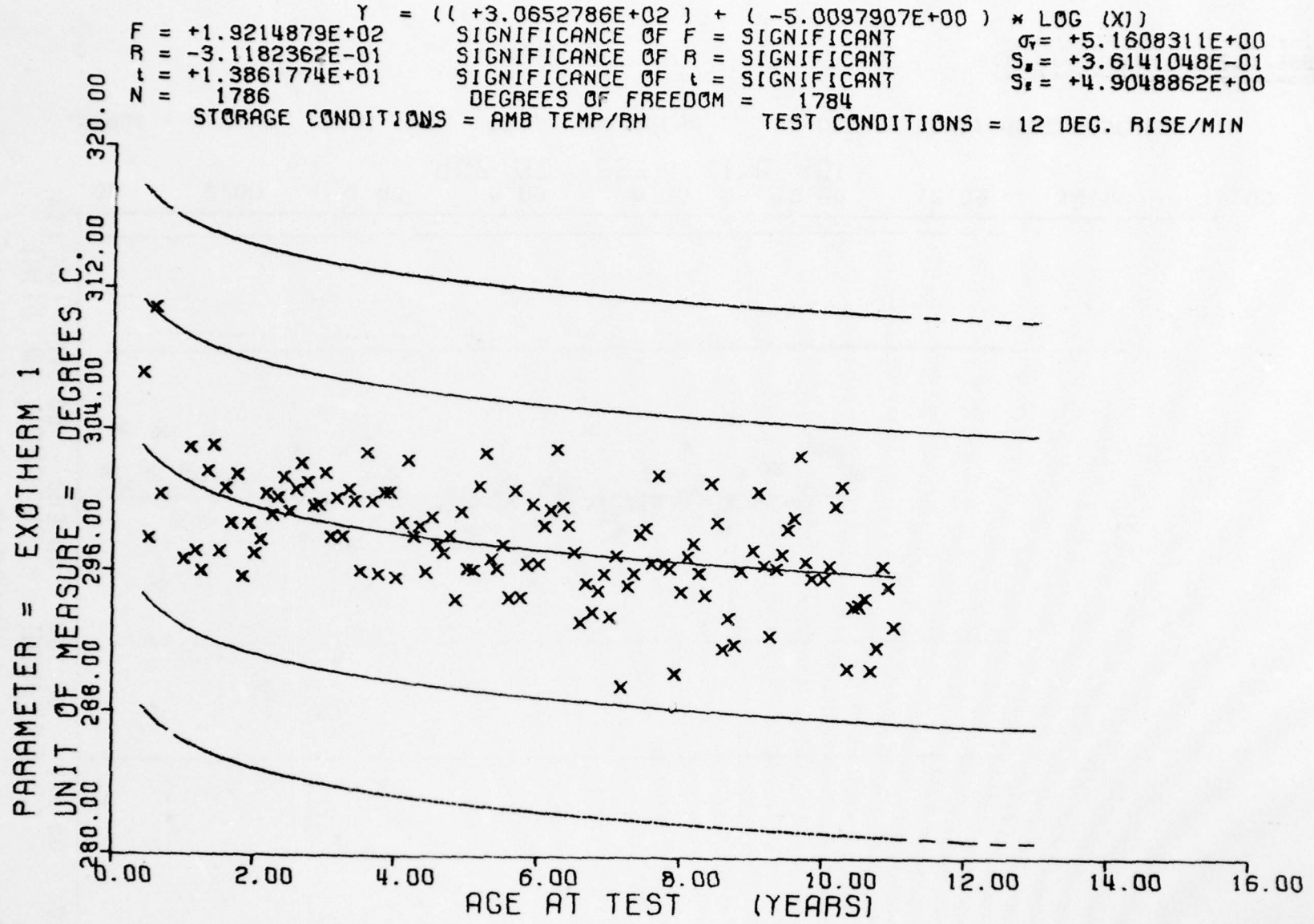
STAGE 1 WING 6, TP-H 1011, DTA, ENDOTHERM 1, 12 DEGREE CENTIGRADE RISE/MIN

This sample size summary is applicable to figures 69 and 70.



STAGE 1 WING 6, TP-H 1011, DTA, ENDOTHERM 1, 12 DEGREE CENTIGRADE RISE/MIN

Figure 69



STAGE 1 WING 6, TP-H 1011, DTA, EXOTHERM 1, 12 DEGREE CENTIGRADE RISE/MIN

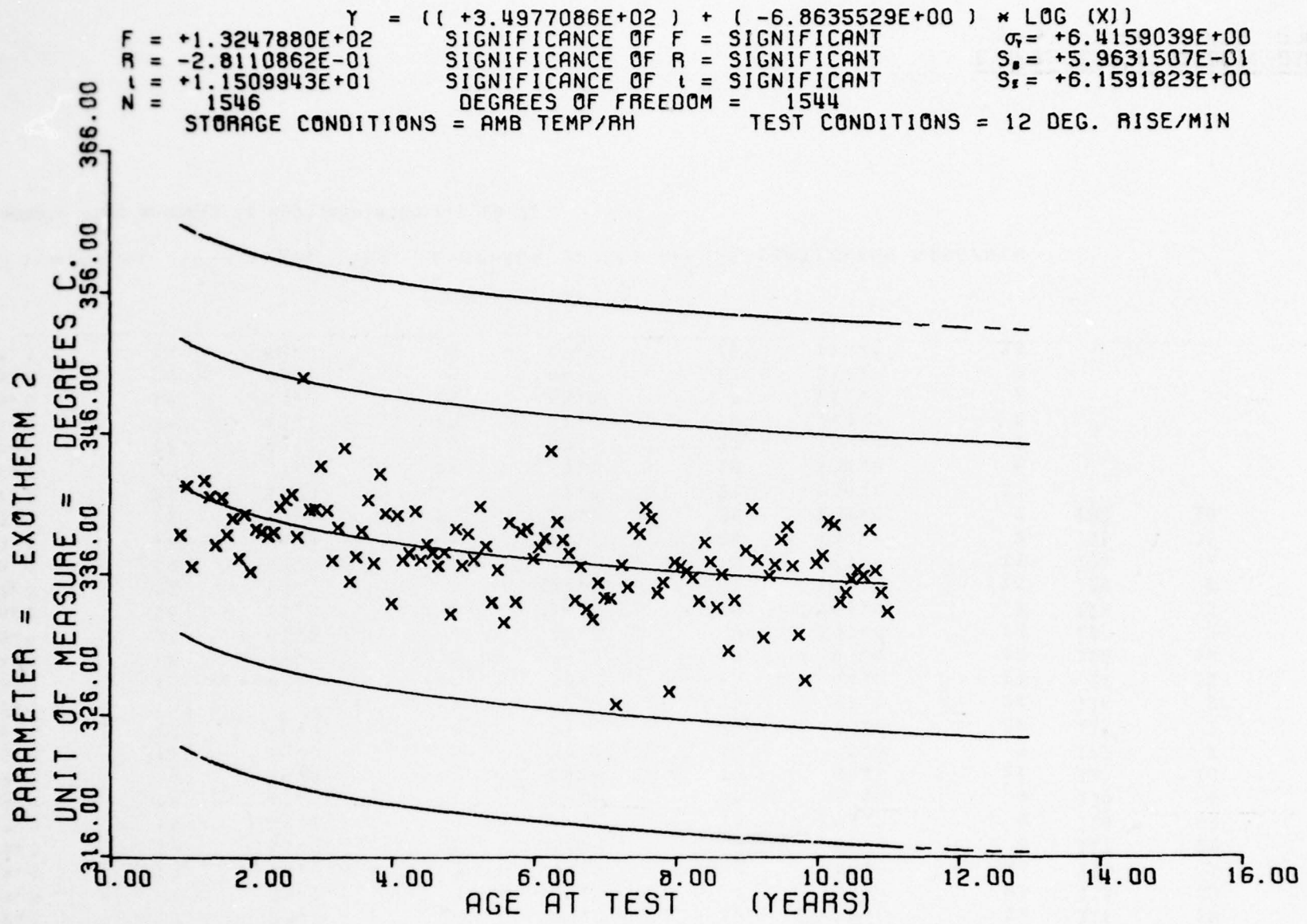
Figure 70

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
12.0	7	38.0	4	63.0	12	88.0	12	114	55
13.0	3	39.0	7	64.0	4	89.0	23	115	22
14.0	7	40.0	13	65.0	9	90.0	26	116	5
16.0	19	41.0	2	66.0	9	91.0	9	117	13
17.0	14	42.0	9	67.0	16	92.0	9	118	40
18.0	18	43.0	10	68.0	6	93.0	9	120	4
19.0	4	44.0	3	69.0	12	94.0	11	121	10
20.0	11	45.0	6	70.0	12	95.0	3	122	7
21.0	22	46.0	6	71.0	20	96.0	22	123	2
22.0	13	47.0	14	72.0	14	97.0	24	124	3
23.0	10	48.0	14	73.0	14	98.0	27	125	15
24.0	9	49.0	5	74.0	9	99.0	22	126	14
25.0	20	50.0	3	75.0	9	100.0	12	127	3
26.0	16	51.0	2	76.0	8	101.0	7	128	13
27.0	12	52.0	4	77.0	7	102.0	10	129	8
28.0	19	53.0	11	78.0	15	103.0	11	130	42
29.0	18	54.0	7	79.0	24	104.0	2	131	35
30.0	22	55.0	15	80.0	30	105.0	7	132	16
31.0	21	56.0	10	81.0	23	106.0	11		
32.0	20	57.0	11	82.0	18	108.0	6		
33.0	11	58.0	14	83.0	22	109.0	9		
34.0	26	59.0	9	84.0	12	110.0	2		
35.0	18	60.0	15	85.0	7	111.0	2		
36.0	24	61.0	8	86.0	12	112.0	8		
37.0	14	62.0	8	87.0	15	113.0	33		

STAGE 1 WING 6, TP-H 1011, DTA, EXOTHERM 2, 12 DEGREE CENTIGRADE RISE/MIN

This sample size summary is applicable to figure 71



STAGE 1 WING 6, TP-H 1011, DTA, EXOTHERM 2, 12 DEGREE CENTIGRADE RISE/MIN

Figure 71

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NO SAMPLES	AGE (MONTHS)	NO SAMPLES	AGE (MONTHS)	NO SAMPLES
14.0	3	53.0	2	86.0	6
16.0	2	54.0	1	97.0	3
17.0	6	55.0	1	108.0	3
18.0	5	57.0	5	109.0	4
19.0	6	58.0	2	113.0	11
21.0	2	59.0	6	114.0	21
22.0	4	60.0	4	115.0	5
23.0	1	64.0	2	116.0	2
24.0	1	66.0	2	117.0	1
25.0	1	77.0	1	118.0	3
26.0	2	78.0	3	123.0	2
27.0	4	79.0	13	130.0	3
28.0	3	80.0	12	131.0	4
29.0	6	81.0	9		
30.0	9	82.0	7		
31.0	4	83.0	9		
33.0	4	84.0	7		
34.0	5	86.0	1		
35.0	4	87.0	6		
37.0	3	88.0	8		
40.0	5	89.0	16		
42.0	3	90.0	12		
45.0	2	91.0	6		
47.0	2	92.0	5		
49.0	1	94.0	2		

STAGE 1 WING F, TF-H 1011, DTA, EXOTHERM 3, 12 DEGREE CENTIGRADE RISE/MIN

This sample size summary is applicable to figure 72

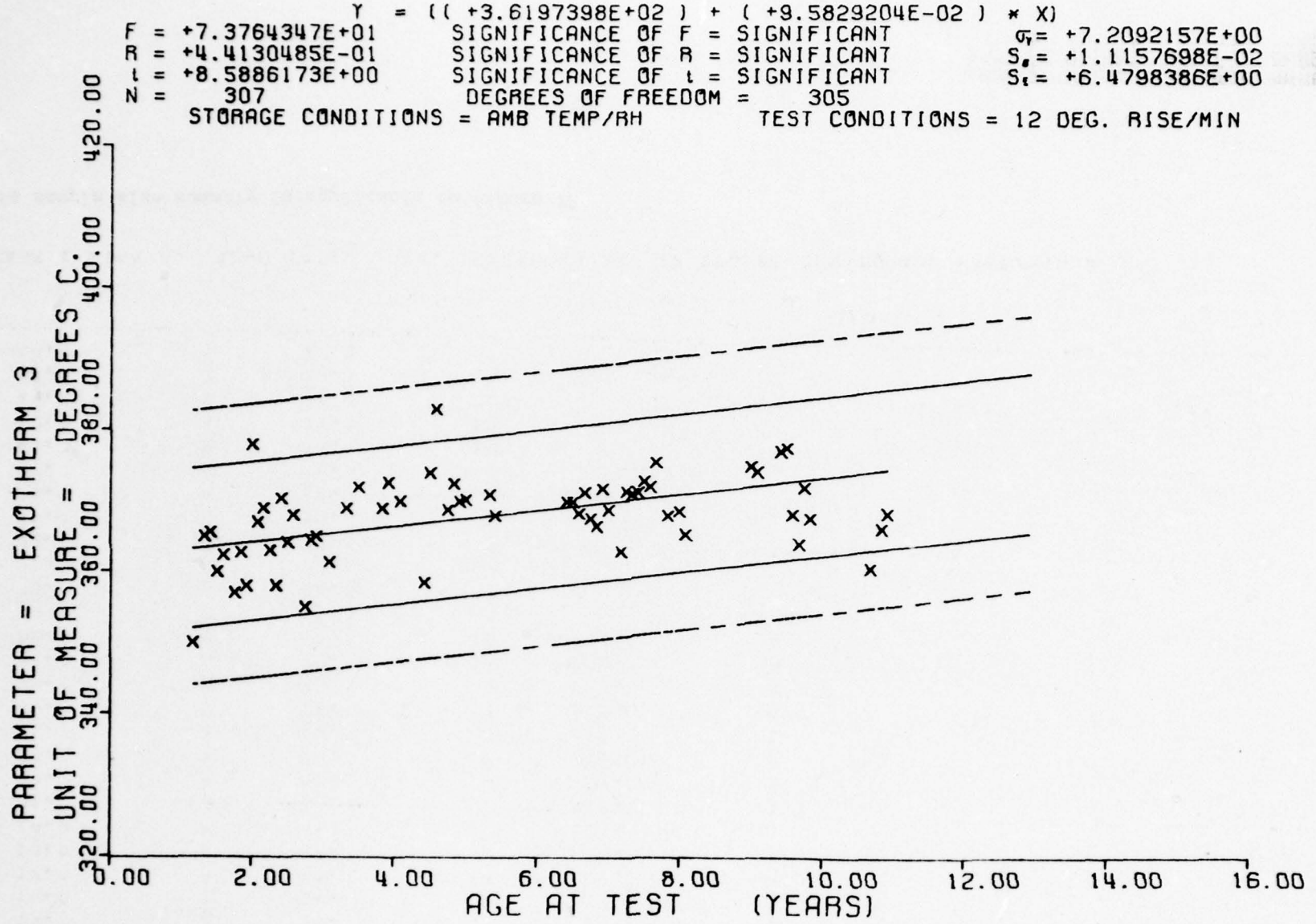

Y = ((+3.6197398E+02) + (+9.5829204E-02) * X)
F = +7.3764347E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +7.2092157E+00
R = +4.4130485E-01 SIGNIFICANCE OF R = SIGNIFICANT S_e = +1.1157698E-02
t = +8.5886173E+00 SIGNIFICANCE OF t = SIGNIFICANT S_t = +6.4798386E+00
N = 307 DEGREES OF FREEDOM = 305
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 12 DEG. RISE/MIN
PARAMETER = EXOTHERM 3
UNIT OF MEASURE = DEGREES C.
320.00
340.00
360.00
380.00
400.00
420.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
AGE AT TEST (YEARS)
STAGE 1 WING 6, TP-H 1011, DTA, EXOTHERM 3, 12 DEGREE CENTIGRADE RISE/MIN

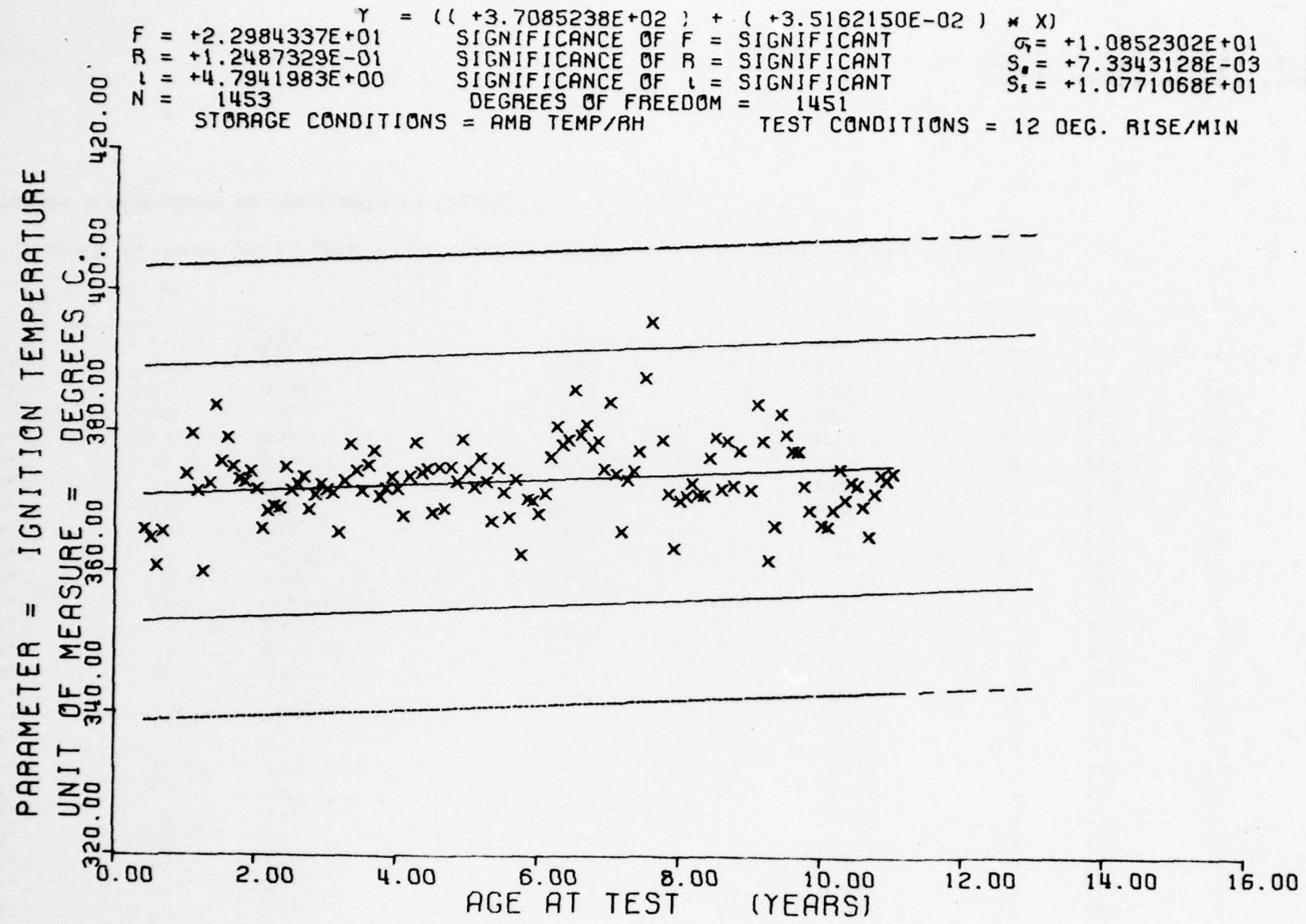
Figure 72

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE MONTHS	NR SAMPLES
5.0	6	33.0	15	58.0	12	83.0	18	109	5
6.0	22	34.0	28	59.0	3	84.0	7	110	2
7.0	11	35.0	18	60.0	12	85.0	8	111	2
8.0	9	36.0	26	61.0	7	86.0	11	112	10
12.0	6	37.0	14	62.0	6	87.0	6	113	27
13.0	3	38.0	5	63.0	12	88.0	5	114	35
14.0	14	39.0	5	64.0	3	89.0	7	115	21
15.0	9	40.0	10	65.0	4	90.0	18	116	6
16.0	21	41.0	2	66.0	4	91.0	5	117	12
17.0	10	42.0	5	67.0	13	93.0	7	118	37
18.0	25	43.0	11	68.0	6	93.0	9	120	4
19.0	6	44.0	3	69.0	12	94.0	9	121	10
20.0	2	45.0	5	70.0	19	95.0	3	122	7
21.0	12	46.0	4	71.0	20	96.0	19	123	2
22.0	7	47.0	11	72.0	16	97.0	24	124	3
23.0	12	48.0	13	73.0	14	98.0	26	125	15
24.0	4	49.0	4	74.0	9	99.0	17	126	15
25.0	28	50.0	3	75.0	9	100.0	14	127	3
26.0	18	51.0	2	76.0	8	101.0	7	128	13
27.0	18	52.0	6	77.0	6	102.0	8	129	9
28.0	22	53.0	11	78.0	13	103.0	11	130	48
29.0	15	54.0	8	79.0	7	104.0	1	131	31
30.0	20	55.0	15	80.0	19	105.0	5	132	16
31.0	25	56.0	11	81.0	14	106.0	8		
32.0	20	57.0	7	82.0	11	108.0	3		

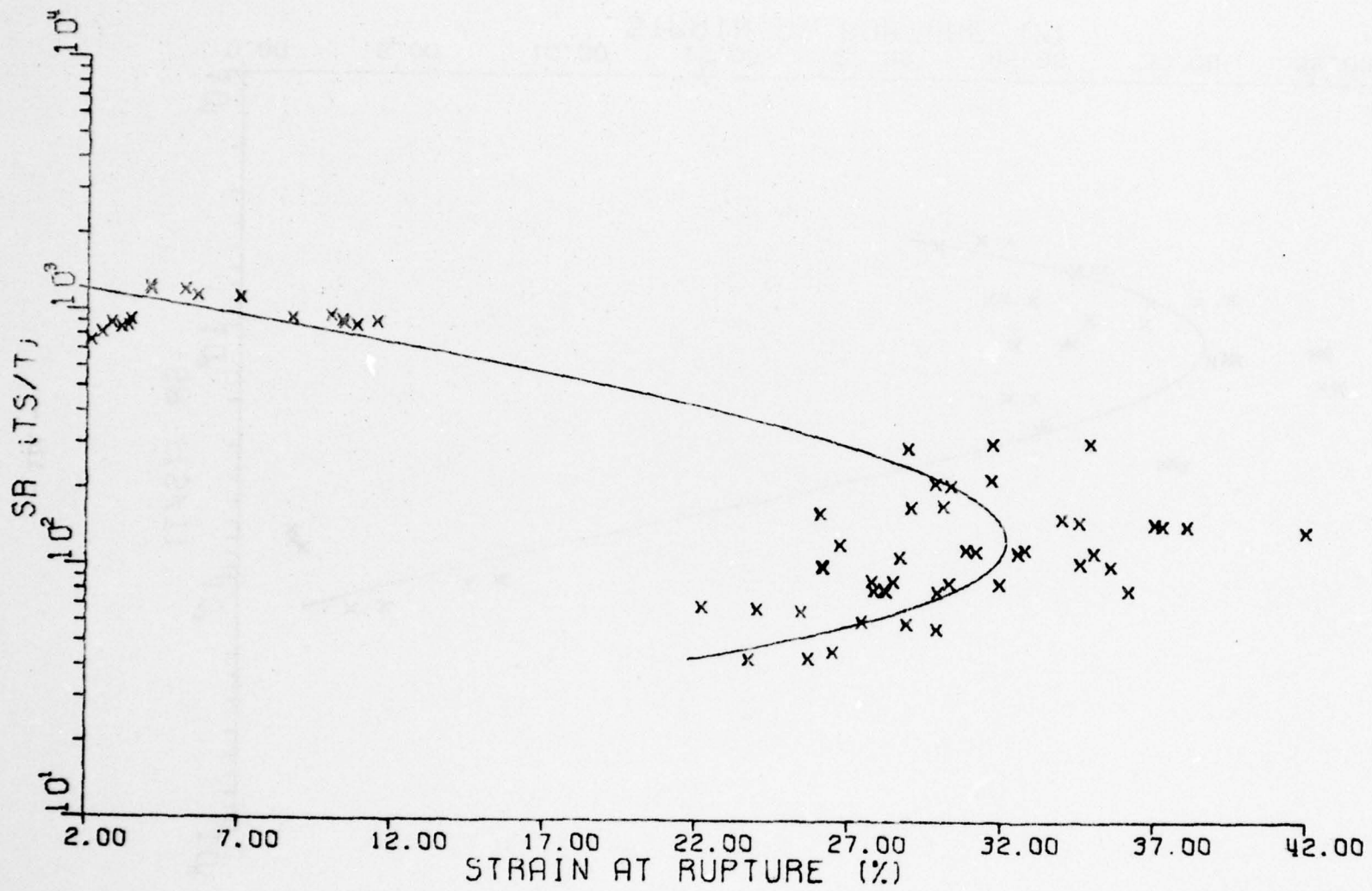
STAGE 1 WING 6. TP-H 1011. DTA. IGNITION TEMPERATURE. 12 DEGREE CENT. RISE/MIN

This sample size summary is applicable to figure 73



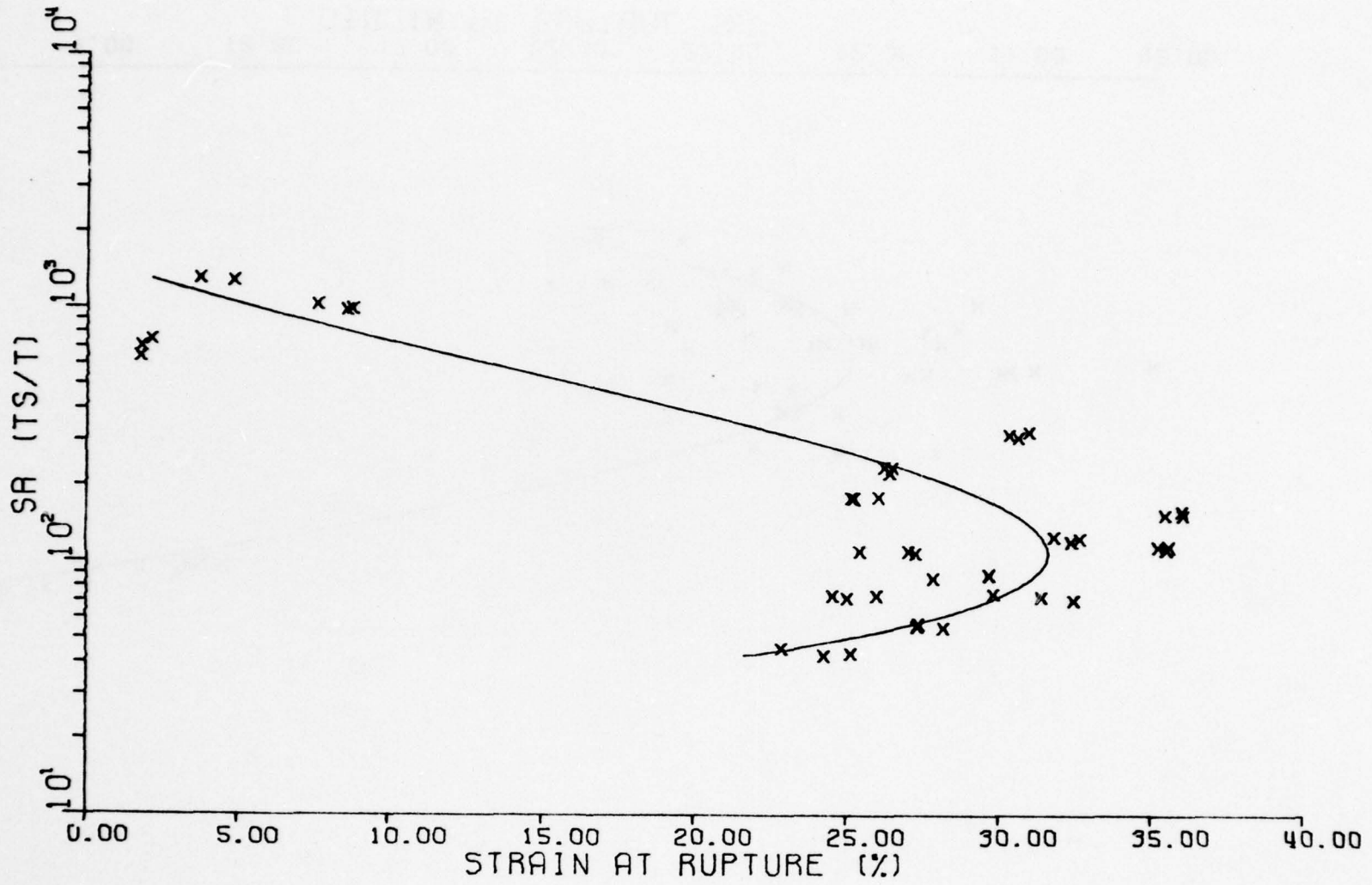
STAGE 1 WING 6, TP-H 1011, DTA, IGNITION TEMPERATURE, 12 DEGREE CENT. RISE/MIN

Figure 73



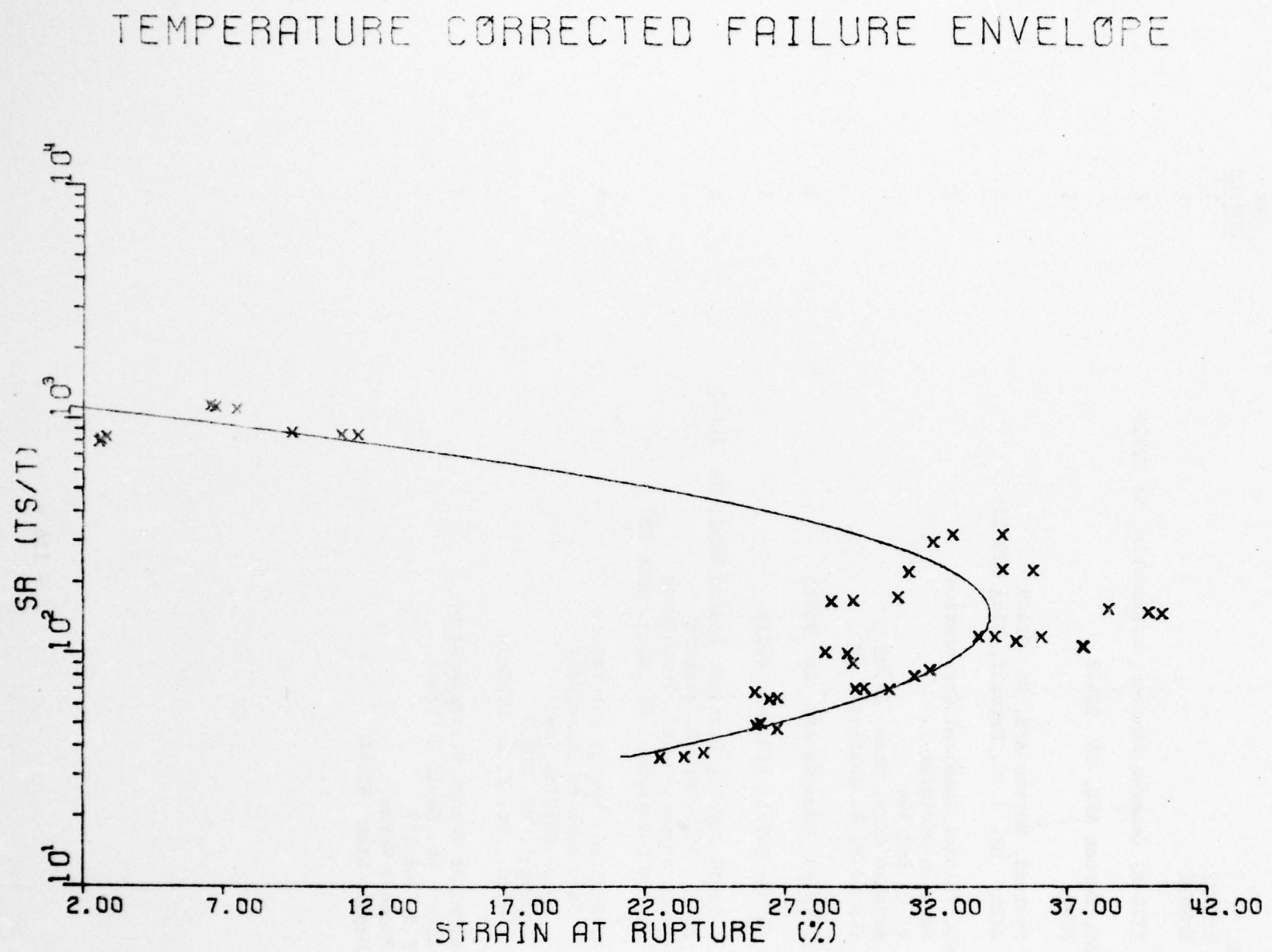
FAILURE ENVELOPE (MOTOR/SN 0014022) BATCH NO.=7960053 STAGE I, WING 6

Figure 74



FAILURE ENVELOPE (MOTOR/SN 0014146) BATCH NO.=7970286 STAGE I, WING 6

Figure 75



FAILURE ENVELOPE (MOTOR/SN 00141731) BATCH NO.=7980160 STAGE I, WING 6

Figure 76

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Minuteman

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant data. Testing was accomplished in accordance with MMWRM Project M82934CWNL17514.

The data from this test period are combined with data from previous testing and entered into the G085 computer for storage, analysis and regression analysis. From the statistical analysis of all data tested to date (twelve and one half

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years for F and G), significant degradation of the propellant does not appear likely for at least two years past the oldest data point.

Each point on the regression plot represents the mean of all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot or group of regression plots. The data range at any age can be found by suitable inquiry of the G085 system.